PROGRAMME BOOK

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Crouser ED et al., Chest. 2017 Sep;152(3):518-526.
Crouser ED et al., Crit Care Med. 2019 Aug;47(8):1018-1025.

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Welcome Message from the President, CPathAMM

First and foremost, congratulations to the Organising Committee of the International Congress of Pathology and Laboratory Medicine 2021 led by Dr Eusni and Dr Leong Chooi-Fun for realising this highly anticipated event. This conference is special to all of us in the College: This is the fourth international congress organised by the College since its birth on 22nd June, 1999; it is held together with the Annual Scientific Meeting 2021; and it is a virtual meeting held during the Covid-19 pandemic. It is an opportunity for participants from Malaysia to meet our fellow workers as well as industry partners from all over the World online!

The theme of this Congress is "Exploring advances and potential of disruptive technologies in pathology and laboratory medicine". It is timely for us to examine these frontiers as we move into the era of the biotechnological revolution hand-in-hand with the 4th Industrial revolution, which will touch every aspect of human life. Healthcare will be increasingly technology driven and dominated by artificial intelligence and big data analytics. Pathologists must rise to the occasion and stay relevant. We must remain the master in exploiting these disruptive technologies and their webs of activities for the benefits of patients, where personalised medicine and point-of-care diagnostics would the order of the day.

This conference provides a platform for discussion from scientific developments to clinical applications, through our invited speakers who are experts of the respective field. Medicine is pathology; the issues covered will be of relevance and interest to everyone, from scientists to medical practitioners.

Last but not least, it gives me great pleasure to warmly welcome you to this Congress held virtually for the first time. My sincere appreciation to all the sponsors as well as the exhibitors for their generous support to make this meeting a successful one, despite the pandemic.

Thank you.

Emeritus Professor Dr Soon-Keng Cheong
President
College of Pathologists
Academy of Medicine of Malaysia

Welcome Message from the Chairpersons

Welcome to the first ever College of Pathologists virtual conference!

On behalf of the Organising Committee, it is our privilege to extend our warmest welcome to the first ever full virtual conference: **2021 International Congress of Pathology and Laboratory Medicine (ICPaLM 2021) and 18th Annual Scientific Meeting, College of Pathologists** which will be held from 3rd-5th March 2021.

COVID 19 pandemic has globally caused major paradigm shift which also affected us causing the rescheduling of the event for several times; hence, we have decided to manoeuvre the event differently from the conventional face-to-face to a fully virtual congress which is coincidentally aligned with the theme chosen for the Congress "***Exploring the Advances and Potential of Disruptive Technologies in Pathology and Laboratory Medicine***".

As we are well-aware, practices of pathology and laboratory medicine have grown exponentially over recent years. Many new technologies such as deep learning, artificial intelligence, big data analysis, data mining, total laboratory automation are becoming norm in these fields. The three-day virtual congress (and a month on demand!) will explore advances and potential of these new technologies in line with existing services in driving pathology and medical practices to the next level.

This event is designed to give us insight in these new technologies and and to learn from the experts how we can embrace them in our future practices. Besides, do take this opportunity to make new connections and networking with leading experts in the respective fields and also reconnect with old friends through virtual platform.

This virtual congress will retain almost all the features of the physical congress which include the scientific contents, booth exhibition for industries and corporate bodies, poster presentation etc. The advantage of a congress in virtual platform is a total new experience for all of us, beside allowing the real-time attending to the scientific contents, it also allow us to revisit the missed-out scientific lectures which will be available for all registered participants for 30 days post event. For booth exhibition, a brand-new experience for both the participants and the corporate parties where participants will be able to visit the virtual booths, make connections and communicate with industry of interest. Therefore, we would like to thank the industries and corporate bodies that have given their support to this event and also welcome more to be part of the Congress by show casing their latest state- of - the-art technologies in the Congress Trade and Exhibition virtually.

Please come and join us to explore the new virtual congress and we look forward in meeting all of you virtually in the 2021 ICPaLM and 18th Annual Scientific Meeting. Thank you for your participation.

AP Dr Eusni Rahayu Mohd.Tohit
Dr Leong Chooi Fun
Chairs,
Organising Committee ICPaLM 2021 and 18th Annual Scientific Meeting College of Pathologists

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Dr. Wong Jun Leong

Programme Overview – 3rd to 5th March 2021

2021	**3 March**		**4 March**		**5 March**
	Wedneday		**Thursday**		**Friday**
8.00 - 8.50 am	Registration	8.30 - 10.15 am	Symposium 2A-E	8.30 - 10.15 am	Symposium 4A-E
8.50 - 9.00 am	Welcome Note by ICPaLM 2021 Chairperson				
9.00 - 10.00 am	K Prathap Memorial Lecture	10.15 - 10.45 am	Break	10.15 - 10.45 am	Break
10.00 - 10.45 am	Launching of CPathAMM Specialty Chapters and 2020 CPathAMM Lifetime Achievement Award	10.45 - 11.30 am	Plenary 3	10.45 - 12.30 pm	Symposium 5A-E
10.45 - 11.15 am	Break	11.30 - 12.00 pm	Lunch symposium	12.30 - 1.00 pm	Lunch symposium
11.15 - 12.00 pm	Plenary 1	12.00 - 2.00 pm	Break/ e-Poster & Exhibition viewing	1.00 - 2.45 pm	Break/ e-Poster & Exhibition viewing
12.00 - 12.30 pm	Lunch symposium	2.00 - 2.45 pm	Plenary 4	2.45 - 3.30 pm	Plenary 5
12.30 - 2.00 pm	Break / e-Poster & Exhibition viewing	2.45 - 4.30 pm	Symposium 3A-E	3.30 - 4.00 pm	Debate
2.00 - 2.45 pm	Plenary 2	4.30- 5.30 pm	Break/ e-Poster & Exhibition viewing	4.00- 4.45 pm	Closing ceremony & award presentation
2.45 - 4.30 pm	Symposium 1A-1E				
4.30 - 5.30 pm	Break/ e-Poster & Exhibition viewing				

3 March 2021 Wednesday	Symposium A	Symposium B	Symposium C	Symposisum D	Symposium E
8.00 - 9.00 am	Registration				
8.50 - 9.00 am	Welcoming Speech by ICPaLM 2021 Chairperson (AP Dr Eusni Rahayu Mohd.Tohit)				
9.00 - 10.00 am	K Prathap Memorial Lecture: Exploring Advances and The Potential of Disruptive Technologies in Pathology and Laboratory Medicine (Prof Dr Jo Martin, UK) (Chairperson: Prof. Dr Cheong Soon Keng)				
10.00 - 10.45 am	Launching of CPathAMM Specialty Chapters (Chapter of Perinatal and Paediatric Pathology, Chapter of Genetic Pathology, Chapter of Transfusion Medicine) and 2020 CPathAMM Lifetime Achievement Award				
10.45 - 11.15 am	Break				
11.15 - 12.00 pm	Plenary 1 Gene therapy - come of age ? (Prof. John Rasko, Australia) (Chairperson: Prof. Dr Cheong Soon Keng)				
12.00 - 12.30 pm	Lunch symposium: A Way of Rolling Out Best in Class Manufacturing of Mesenchymal Stem Cells (Dr Vijayendran Govindasamy, CryoCord)				
12.30 - 2.00 pm	Break/ e-Poster & Exhibition viewing				
2.00 - 2.45 pm	Plenary 2 Role of Molecular Genetics and Immunohistochemistry in Renal Neoplasms (Prof. Brett Delahunt, New Zealand) (Chairperson: Dr Roziana Ariffin)				
Symposium 1A-E 2.45 - 4.30 pm	Symposium 1A - Anatomic Pathology & Cytopathology (Digital Pathology and Artificial Intelligence) (Chairperson: Dr Arni Talib and Dr Fauzah Abd Ghani)	Symposium 1B - Chemical Pathology (Novel biomarkers in diseases) (Chairperson: AP Dr Subashini C. Thambiah)	Symposium 1C - Haematology and Transfusion Medicine (Nobel Prize Stem Cell - IPSC) (Chairperson: Prof. Dr Cheong Soon Keng)	Symposium 1D - Forensic Medicine, Paediatric and Perinatal Pathology (Chairperson: Datuk Dr Mohd Shah Mahmood)	Symposium E - Medical Microbiology, Parasitology and Immunology (Chairperson: AP Dr Asrul Abdul Wahab)
2.45 - 3.15 pm	Digital Pathology in Anatomical Pathology: An enabler of Artificial Intelligence (Distinguished Prof. Ulung Datuk Dr Looi Lai Meng, Malaysia)	Cardiac Biomarkers of Acute Coronary Syndrome: A Historical Perspective (Assoc. Prof. Dr Thuhairah Hasrah Abdul Rahman, Malaysia)	Advantages of IPSC generated MSC (Prof. John Rasko, Australia)	Challenging Cases - Do We Really Know? (Assoc Prof. Dr Philip Beh, Hong Kong)	Mass spectrophotometry application in infectious diseases (Dr Kartina Md. Noor, Malaysia)
3.15 - 3.45 pm	Accelerating Digital Pathology Image Analysis Powered by NVIDIA Clara (Dr Eddie Huang, Singapore)	Biochemical Markers for Non-Alcoholic Fatty Liver Disease (NAFLD) (Assoc. Prof. Dr Pavai Sthaneshwar, Malaysia)	Use of banked cord blood to create a clinically compliant iPSC Masterbank for potential cellular therapies (Assoc Prof Dr Ngaire Elwood, Australia)	Approach to Complicated Forensic Cases - Canada's Experience (Prof. Dr C Milroy, Canada)	Clinical Application of Rapid Diagnostic Test in Infectious Diseases (Prof. Dr Alex van Belkum, France)
3.45 - 4.15 pm	The Utility of Artificial Intelligence in Diagnostic Pathology (Assoc. Prof. Shahnorbanun Sahran, Malaysia)	New Biomarkers in Diabetes Mellitus (Assoc. Prof. Dr Wong Moh Sim, Singapore)	CAR T-cell Therapy: A new era in cancer immunotherapy (Dato' Dr Chang Kian Meng)	Approach to Complicated Forensic Cases - Malaysia's Experience (Dato' Dr Zahari Noor, Malaysia)	Current Trends in Microbiological Diagnostics (Prof. Dr Alex van Belkum, France)
4.30 - 5.30 pm	e-Poster & Exhibition viewing				

4 March 2021 Thursday	Symposium A	Symposium B	Symposium C	Symposisum D	Symposium E
Symposium 2A-E 8.30 - 10.15 am	Symposium 2A - Anatomic Pathology & Cytopathology (Gynaecological Pathology) (Chaiperson: Dr Razana Mohd Ali and Dr Nordashima Abd Shukor)	Symposium 2B - Chemical Pathology (POCT) (Chairperson: Dr Aletza Mohd Ismail)	Symposium 2C - Haematology and Transfusion Medicine (Morphology & Utility of New Blood Count Parameters) (Chairperson: Dr Nik Rus Mazeni Nik Yusoff)	Symposium 2D - Forensic Medicine, Paediatric and Perinatal Pathology (Chairperson: Dr Chng Kay Ly)	Symposium 2E - Medical Microbiology, Parasitology and Immunology (Chairperson: Dr Hasni Mahayidin)
8.30 - 9.00 am	An Update on Endometrial Neoplasia (Prof. Teck Yee Khong, Australia)	Experience Sharing in Establishing POCT (Assoc. Prof. Dr Wong Moh Sim, Singapore)	Haematology Parameters in Infections, Practicality & Trend (Prof. Dr Ida Parwati, Indonesia)	Placental Infection and Stillbirth (Prof. Dr Tan Geok Chin, Malaysia)	Genetic Approaches in Diagnosing Patients with Primary Immunodeficiency Diseases (Dr Siti Mardhiana Mohamad, Malaysia)
9.00 - 9.30 am	Current Issues in Gynaecological Pathology (Dr Razmin Ghazali, Malaysia)	Point of Care Testing and Clinical Governance in Malaysia (Datin Dr Baizurah Mohd Hussain, Malaysia)	Artificial Intelligence: The Future in Haematology Diagnostics (Prof. Dr. N. Veera Sekaran, Malaysia)	Placental causes of stillbirth - sharing local experience (Dr Nur Syahrina Rahim, Malaysia)	Updates in Allergic Testing (Dr. Amir Hamzah Abdul Latiff, Malaysia)
9.30 - 10.00 am	Endometrial Cancer - Getting Younger and Younger (Prof. Dr Nor Hayati Othman, Malaysia)	Impact of POCT in Clinical Decision Making (Assoc. Prof. Dr Wong Moh Sim, Singapore)	Illustrative Cases in Multicolor Flowcytometry (Dr Mimi Azura Aziz, Malaysia)	Forensic significance of intrauterine death (Dr Khairul Anuar Zainun, Malaysia)	Anti-Nuclear Antibody Test-An Update (Assoc. Prof. Dr Asrul Abdul Wahab, Malaysia)
10.15 - 10.45 am	Break				
10.45 - 11.30 am	Plenary 3 Using autopsy Data - More Can be Done? (Assoc Prof. Dr Philip Beh, HK) (Chairperson: Dato' Dr Zahari Noor)				
11.30 - 12.00 pm	Lunch symposium: Automation Within Your Reach (Mr Clarence Chia, Beckman Coulter)				
12.00 - 2.00 pm	Break/ e-Poster & Exhibition viewing				
2.00 - 2.45 pm	Plenary 4 Uberisation of Laboratory Services: The Impact of Mobile Health Technology on Laboratory Services (Prof. Tony Badrick, Australia) (Chairperson: AP Dr Intan Nureslyna Samsudin)				
Symposium 3A-E 2.45 - 4.30 pm	Symposium 3A - Anatomic Pathology & Cytopathology (Neuropathology and Genetic) (Chairperson: AP Dr Maizaton Atmadini Abdullah & AP Dr Wong Yin Ping)	Symposium 3B - Chemical Pathology (Metabolic Medicine) (Chairperson: Dr Fathimah Mohamad)	Symposium 3C - haematology and Transfusion Medicine (Molecular updates in Haematological Disorders) (Chairperson: Dr Raudhawati Osman)	Symposium 3D - Forensic Medicine, Paediatric and Perinatal Pathology (Chairperson: Dr Emizam Mohamadon)	Symposium 3E-Medical Microbiology, Parasitology and Immunology (Chairperson: Dr Aw Kar Men)
2.45 - 3.15 pm	Not Just the Mucosa...New Challenges and Pitfalls in the Neuromuscular Structures of the Bowel Wall (Prof. Jo Martin, UK)	Laboratory Testing in Thyroid Conditions: Pitfalls and Clinical Utility (Prof. Dato' Dr Mafauzy Mohamed, Malaysia)	Parallel bimodal single-cell sequencing of transcriptome and chromatin accessibility (Dr Jonathan Loh, Singapore)	Role of 2nd Autopsy - Malaysia's experience (Dr Siew Sheue Feng, Malaysia)	What We Should Know About SARS Coronavirus 2 (Prof. Dr Zamberi Sekawi, Malaysia)
3.15 - 3.45 pm	Molecular Update on Astrocytoma (Prof. Wong Kum Thong, Malaysia)	Bone Health and Cardiovascular Risk Factors (Assoc. Prof. Dr Subashini C. Thambiah, Malaysia)	NGS in Thal diagnosis (Prof. Vip Viprakasit, Thailand)	Role of 2nd Autopsy - India's experience (Prof Dr OP Murty, India)	Diagnostic Challenges of Hepatitis B Escape Mutant (Assoc. Prof. Datin Dr Noor Zetti Zainol Rashid, Malaysia)
3.45 - 4.15 pm	Frontiers in Molecular Diagnostics: Solid Tumour and Cancer Genetics (Dr Roziana Ariffin, Malaysia)	Data Interpretation of Endocrine Cases (Dr. Leslie Lai, Malaysia)	Prenatal diagnosis of haematological disorder (Prof. Vip Viprakasit, Thailand)	Reviewing autopsy/ autopsy reports in Hong Kong (Assoc Prof. Dr Philip Beh, Hong Kong)	Molecular Diagnostics for Viral Meningitis and Encephalitis (Prof. Dr Jamal I-Ching Sam, Malaysia)
4.30 - 5.30 pm	Break/ e-Poster & Exhibition viewing				

5 March 2021 Friday	Symposium A	Symposium B	Symposium C	Symposium D	Symposium E
Symposium 4A-E 8.30 - 10.15 am	Symposium 4A - Anatomic Pathology & Cytopathology (Diagnostic Challenges: Prostate/Lymphoma) (Chairperson: Dr Huzlinda Hussein & Dr Ahmad Toha Samsudin)	Symposium 4B - Chemical Pathology (Data Mining) (Chairperson: Dr Dian Nasriana Nasuruddin)	Symposium 4C - Haematology and Transfusion Medicine (Haematological malignancies) (Chairperson: AP Dr Sabariah Md Noor & Dr Shenaz Banu Said Khan)	Symposium 4D - Forensic Medicine, Paediatric and Perinatal Pathology (Chairperson: Dr Razuin Rahimi)	Symposium 4E - Medical Microbiology, Parasitology and Immunology (Chairperson: Dr Ahneez Abdul Hamid)
8.30 - 9.00 am	Intraductal Carcinoma of Prostate: Facts and Controversies (Prof. Brett Delahunt, New Zealand)	Patient-based Real-Time Quality Control: Review and Recommendations (Dr Loh Tze Ping, Singapore)	Understanding of MDS/MPN Based on Pathogenesis & Approach to Diagnosis (Prof. Dr Raja Zahratul Azma, Malaysia)	Forensic Anthropology - Challenges and the Way Forward (Dr Mohamad Azaini Ibrahim, Malaysia)	Update on Parasitic Infections - Conventional and Advanced Diagnostic Approaches (Prof. Dr Rukman Awang Hamat, Malaysia) (8.30 am to 9.15 am) Molecular Diagnosis of Malaria - What's New? (Dr Zulkarnain Md Idris, Malaysia) (9.15 am - 10.00 am)
9.00 - 9.30 am	Prognostification of low grade lymphoma by molecular subtyping (Dr Noraidah Masir, Malaysia)	Indirect Reference Range Establishment (Dr Loh Tze Ping, Singapore)	NGS for MRD Detection in Acute Leukaemia (Prof. Rosline Hassan, Malaysia)	Result of Toxicology Analysis - Interpret it Wisely (Dr Khairul Adli bin Nikman, Malaysia)	
9.30 - 10.00 am	Molecular Characterisation of High grade B cell Lymphoma for Diagnosis and Prognosis (Dr Noraidah Masir, Malaysia)	Delta Checks in Clinical Laboratory (Dr Loh Tze Ping, Singapore)	Liquid Biopsy: The Future in Haemato-Oncology Diagnosis (Dr Yuslina Mat Yusoff, Malaysia)	Forensic DNA Analysis - Challenges and the Way Forward (Pn Nor Aidora Saedon, Malaysia)	
10.15 - 10.45 am	Break				
Symposium 5A-E 10.45 - 12.30 pm	Symposium 5A - Anatomic Pathology & Cytopathology (Current issues in Pathology) (Chairperson: Prof. Dr Tan Geok Chin & Dr Salmi Abdullah)	Symposium 5B - Chemical Pathology (Application of Mass Spectometry in Chemical Pathology testing) (Chairperson: Dr Hanisah Hamid)	Symposium 5C - Haematology and Transfusion Medicine (Recent Advances in Blood Transfusion) (Chairperson: Dr Nor Nazahah Mahmud)	Symposium 5D - Forensic Medicine, Paediatric and Perinatal Pathology (Chairperson: Dr Khairul Anuar Zainun)	Symposium 5E - Medical Microbiology, Parasitology and Immunology (Chairperson: Dr Wong Jun Leong)
10.45 - 11.15 am	Update in the Pathology of Fatty Liver (Prof. Huang Shiu Feng,Taiwan)	LC-MS/MS Technology and Applications in the Clinical Laboratory (Dr Fionn Quinlan, Taiwan) (10.45 - 11.30 am) Application of LC-MS/MS in Newborn Screening (Dr Salina Abdul Rahman, Malaysia) (11.30am - 12.15 pm)	Patient Blood Management in Malaysia-Challenges and the Way Forward (Dr Nor Hafizah Ahmad, Malaysia)	Technology - Destructive or Supportive Evidence in Court (Prof. Dr C Milroy, Canada)	The Role of Non-Cultural Technique in Yeast Infection (Assoc. Prof. Dr Azian Harun, Malaysia)
11.15 - 11.45 am	Early Pregnancy Loss and Pregnancy of Unknown Location (Prof. Teck Yee Khong, Australia)		Non-Homologous Use of Cord Blood (Assoc Prof Dr Ngaire Elwood, Australia)	Histology - Supportive or Detrimental Evidence in Court (Dr Mohd Suhani Mohd Noor, Malaysia)	Current Microbiological Techniques for the Diagnosis of Nontuberculous Mycobacterium Infections (Assoc. Prof. Dr Nadia Atiya, Malaysia)
11.45 - 12.15 pm	The National Biobank Consortium: Relevance, Needs and Strategies (Prof. Datuk Dr A Rahman A Jamal, Malaysia)		Passenger Lymphocyte Syndrome (Assoc. Prof. Dr Nurasyikin Yusof, Malaysia)	Forensic Imaging - Destructive or Supportive Evidence in Court (Assoc. Prof. Datin Dr Mansharan Kaur A/P Chainchal Singh, Malaysia)	Sepsis Biomarkers (Assoc. Prof. Dr Tan Toh Leong, Malaysia)
12.30 - 1.00 pm	Lunch symposium: Steps Ahead in the Fight Against Viral Hepatitis (Dr Tan Swee Jin, Sysmex Asia Pacific)				
1.00 - 2.45 pm	Break/ e-Poster & Exhibition viewing				
2.45- 3.30 pm	Plenary 5 Lessons from COVID-19 Pandemic: Laboratory Perspective (Dr. Ravindran Thayan, Malaysia) (Chairperson: Prof. Dr Syafinaz Amin Nordin)				
3.30- 4.00 pm	Debate : Will AI replaces the Pathologists For: Prof. Dr. N. Veera Sekaran (UTAR) Against : Dr Ng Soo Chin (SJMC) Moderator: Prof. Dr Yasmin Abdul Malik				
4.00 - 4.45 pm	Best Poster Award Announcement- AP Dr Intan Nureslyna Samsudin & Closing Ceremony-Dr Leong Chooi Fun				

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T3 NEW
FT4 NEW
FT3 NEW
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Anti-Jo-1 IgG
Anti-M2-3E IgG
Anti-Histones IgG
Anti-nRNP/Sm IgG
Anti-SS-B IgG
Anti-SS-A IgG
TGA (Anti-Tg)
Anti-TPO
TRAb
TMA
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hs-CRP
PCT (Procalcitonin)
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LH
HCG/β-HCG NEW
PRL (Prolactin)
Estradiol
Testosterone
free Testosterone
DHEA-S
Progesterone
free Estriol
17-OH Progesterone
AMH
SHBG
Androstenedione
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HBsAg
Anti-HBs
HBeAg
Anti-HBe
Anti-HBc
Anti-HCV
Syphilis
Anti-HAV
HAV IgM
HIV Ab/Ag Combi
Chagas
HTLV I+II
H.pylori IgG
H.pylori IgA
H.pylori IgM
2019-nCoV IgG NEW
2019-nCoV IgM NEW
SARS-CoV-2 S-RBD IgG NEW
SARS-CoV-2 Neutralizing Antibody NEW
*SARS-CoV-2 Antigen NEW
*Anti-HBc IgM

Prenatal Screening
AFP (Prenatal Screening)
Free β-HCG
PAPP-A
free Estriol

Bone Metabolism
Calcitonin
Osteocalcin
25-OH Vitamin D NEW
Intact PTH
*β-CrossLaps (β-CTx)
*total P1NP

Tumor Markers
AFP
CEA
Total PSA
f-PSA
CA 125
CA 15-3
CA 19-9
PAP
CA 50
CYFRA 21-1
CA 242
CA 72-4
NSE
S-100
SCCA
TPA-snibe
ProGRP
HE4
HER-2
PIVKA-II

Hepatic Fibrosis
HA
PIIIP N-P
C IV
Laminin
Cholyglycine

TORCH
Toxo IgG
Toxo IgM
Rubella IgG
Rubella IgM
CMV IgG
CMV IgM
HSV-1/2 IgG
HSV-1/2 IgM
HSV-2 IgG
*HSV-2 IgM
*HSV-1 IgG
*HSV-1 IgM

Immunoglobulin
IgM
IgA
IgE
IgG

Drug Monitoring
Digoxin
CSA (Cyclosporine A)
FK 506 (Tacrolimus)

Cardiac
CK-MB
Troponin I
Myoglobin
hs-cTnI
H-FABP
NT-proBNP
BNP
D-Dimer
Lp-PLA2
*MPO

Anemia
Vitamin B12
Ferritin
Folate (FA)
*RBC Folate

Hypertension
Direct Renin
Aldosterone
Angiotensin I
Angiotensin II
Cortisol
ACTH

Kidney Function
β_2-MG
Albumin
*NGAL

EBV
EBV EA IgG
EBV EA IgA
EBV VCA IgG
EBV VCA IgM
EBV VCA IgA
EBV NA IgG
EBV NA IgA

Metabolism
Pepsinogen I
Pepsinogen II
Gastrin-17
GH (hGH)
IGF-I
IGFBP-3

* Available soon

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K PRATHAP MEMORIAL LECTURE

Exploring Advances and the Potential of Disruptive Technologies in Pathology and Laboratory Medicine

Prof. Jo Martin
Professor of Pathology, Queen Mary University of London, *Hon. Consultant Barts Health NHS Trust*

Rapid advances in technology are impacting all areas of pathology. Over the next few years we can expect to see even more amazing things come into our world and into our practice. Both the technology that we use and the ways in which we deploy it will change the way we work. We have glimpses of advances that will change the way we assess histological slides, and the data science tools are being developed that will allow us to provide personalised reports of therapeutic options for tumours.

Integrative pathology, with the use of genetic and protein data alongside morphological interpretation, will come into every area of our practice, both benign and malignant. This presentation will highlight some of the new methods that are under development, some of the new tools becoming available and some of the changes that we can expect both in coming years and the longer term.

PLENARY 1

Gene therapy - come of age?

Prof. John Rasko
Professor of Medicine, University of Sydney, Australia

PLENARY 2

Plenary 2 Role of Molecular Genetic and Immunohistochemistry in Renal Neoplasms

Prof. Brett Delahunt
Professor of Pathology and Molecular Medicine, Wellington School of Medicine and Health Sciences, University of Otago, Wellington, New Zealand

There have been major advances in the classification of renal cell neoplasia since the publication of the first classification by the World Health Organization (WHO) in 1981 and while the diagnostic emphasis has been on morphological features, the role of molecular genetics (MG) and immunohistochemistry (IH) is increasing. The Mainz Classification in 1986 established clear cell renal cell carcinoma (RCC), papillary RCC, chromophobe RCC and collecting duct carcinoma as distinctive tumor morphotypes, with renal medullary carcinoma later being added as a separate subtype of collecting duct carcinoma. It was also concluded that sarcomatoid RCC represented an extreme form of tumor dedifferentiation rather than a separate morphotype. Mucinous tubular and spindle RCC and translocation carcinomas were added to the classification in 2004 and here the role of IH and MG took on a new prominence. The Vancouver Classification of 2012 added tubulocystic RCC, acquired cystic disease-associated RCC, clear cell (tubulo) papillary RCC and hereditary leiomyomatosis RCC syndrome-associated RCC to the spectrum of RCC. Two further entities were also recognized. Hybrid oncocytic chromophobe tumor was classified as a variant of chromophobe RCC, while t(6;11) translocation carcinoma was added to the group of translocation carcinomas. In addition to these, three newly recognized morphotypes of RCC (thyroid-like follicular RCC, succinate dehydrogenase B deficiency-

associated RCC and ALK-translocation RCC) were classified as emerging entities, emphasizing the increasing diagnostic role of IH. More recently eosinophilic solid and cystic RCC and biphasic papillary RCC have also been recognized as novel tumors with characteristic IH features.

PLENARY 3
Using Autopsy Data – More Can Be Done
Assoc. Prof. Dr Philip Beh
Associate Professor in Forensic Pathology, Department of Pathology, Li Ka Shing Faculty of Medicine, The University of Hong Kong

Despite declining trends and numbers of autopsies throughout the world, large numbers of autopsies are still being performed annually. Findings from such autopsies are compiled in reports and frequently filed away with little attention given to the rich amount of information that can be obtained from such a large database of information. This presentation is a humble description of my personal journey and I hope an encouragement to the audience to think about the possibilities available to them and the opportunities to enrich knowledge and to prevent injuries and death.

PLENARY 4
The Uberisation of Laboratory Services: The Impact of Mobile Health Technology on Laboratory Services
Prof. Tony Badrick
CEO, Royal College of Pathologists of Australasia Quality Assurance Programs

Uberisation is the act or process of changing the market for a service by introducing a different way of buying or using it, especially using mobile technology. Common examples are Uber, Waze and Airbnb. Could we see this same concept applied in laboratories?

Uberization of Healthcare is a situation where the healthcare professional is able to reach out to the patient as and when required, using the power of technology and the internet. The concept of Uberization of Healthcare is very straightforward; with the use of smartphones, the internet, mobile apps and GPS, patients will be able to contact medical professionals as per their convenience. The medical professionals can provide remote treatment or emergency services, if the need arises, without the patients having to step out of their homes. The promise of platform systems is that they will improve aspects of healthcare such as waiting time, logistics support, referrals and times for treatment decisions. In general health care these promises are happening in the form of Retail Clinics in the USA where immediate demand is matched to slack supply.

But there are practical problems. Traditional health care organizations fear patients' Tweets and Yelp reviews because they are often a consequence of poor care or a bad experience. Funding is an obstacle to this form of disruption and healthcare generally lags decades behind consumer technology.

There have been examples of the Uber concept in pathology. Delivery of specimens in cities by 'Uber' cyclists and the recent pandemic with its popup collection centres has shown what could be achieved. There is scope for more mobile PoCT testing for chronic disease markers.

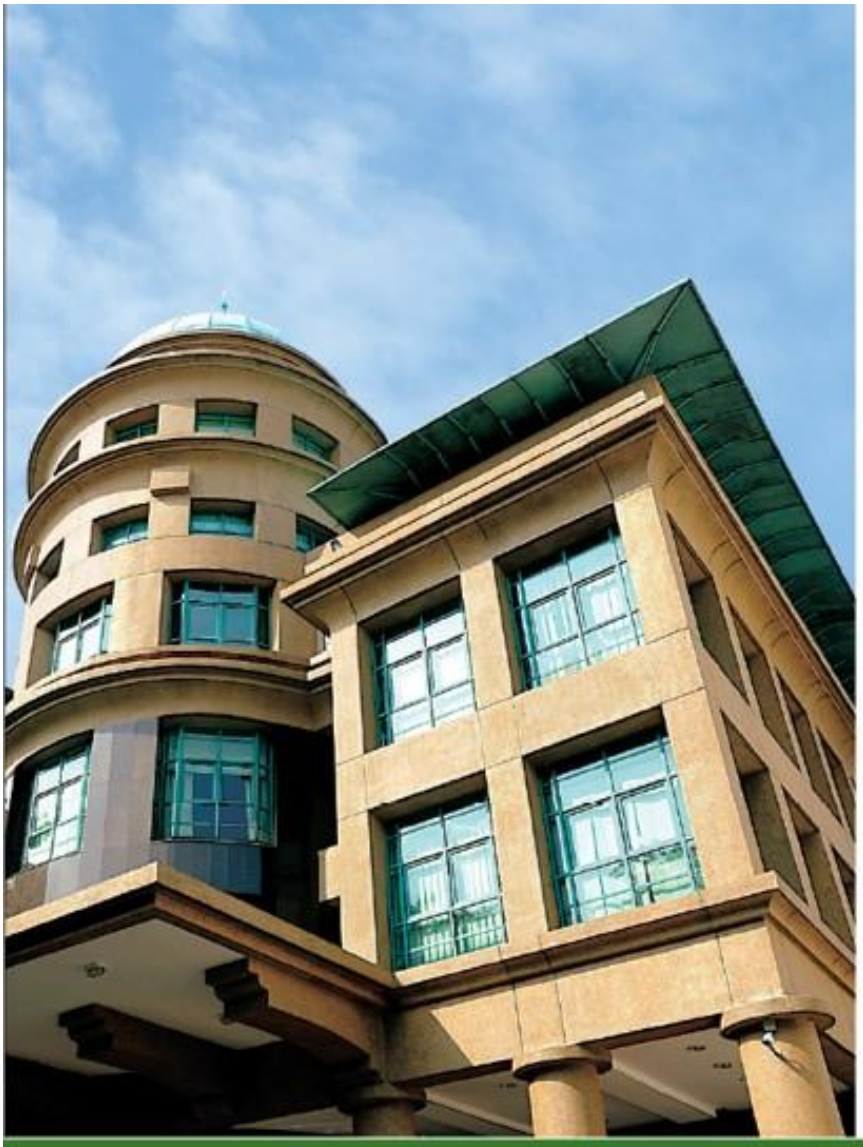
Perhaps looking at the Uber concept of developing universal platforms that improve efficiency, optimize access, and reduce cost of use is a likely development in Pathology. Digital image analysis supported by AI could be an example.

PLENARY 5
Lessons from COVID-19 Pandemic: Laboratory Perspective
Dr. Ravindran Thayan
Institute for Medical Research, Kuala Lumpur

China had reported an outbreak of a respiratory infections in Wuhan province in late 2019. The outbreak was later defined as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), caused by a type of coronavirus similar to SARS-CoV-1 which also occurred in China in 2002-2003. COVID-19 is another name given to SARS-CoV-2 and the virus is zoonotic in nature and full genome sequencing revealed its close homology to pangolin and bat coronaviruses.

Over the past 25 years there have been a number of outbreaks, mostly being zoonotic in nature. Past infections include Nipah, SARS-CoV-2, Pandemic Influenza 09, MERS-CoV, Ebola, Zika and Rabies. Because of the novelty of the infecting pathogen as well as the risk the pathogen, it is very important for laboratories to have the capacity to diagnose these infections, as this is the first step to isolate, contain and manage the infections.

COVID-19 has served to remind us of several important things. First, outbreaks of infectious and transmissible pathogens occur more frequently due to increase in human and animal interface. Second, international travel and globalization are components for the global dissemination of emerging pathogens. Third, limitations of supply chain when a sharp increase in demand for products or substituents of products needs to be addressed. Fourth, clinical microbiology laboratories need to be fully operational and well equipped with the infrastructure and manpower to provide critical care testing for optimal patient care. A robust and well-funded public health system, including microbiology laboratory support, is critical to be able to respond to emerging infectious diseases challenges. Fifth, encourage national and international collaboration for urgent development of necessary interventions (i.e., diagnostic tests, drugs or vaccines).



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Anatomic Pathology & Cytopathology

Symposium 1A

Digital Pathology in Anatomical Pathology: An enabler of Artificial Intelligence
Professor Ulung Datuk Dr Looi Lai Meng
Consultant Histopathologist and National Distinguished Professor, University of Malaya, Malaysia

Central to anatomical pathology practice is the visualization of alterations to tissue structure and cellular details, and the interpretation of what these alterations mean. Thus, the capture of high quality images is crucial. In principle, there are 3 essential components of image handling: (1) processing of tissues and cells to allow microscopic viewing, (2) tools to capture microscopic images for study, and (3) a trained histopathologist who can interpret the images and make a clinically relevant diagnosis. Automation for processing and staining of tissues has been the major advancement for the first component. However, it was the development of the virtual microscope, conversion of light microscopy images into electronic images (digital pathology), addressing the second essential component, that has been the major enabler of artificial intelligence (AI) in anatomical pathology. Computing power today can support scanning of complete tissue sections - Whole Slide Imaging (WSI) - to convert the image information to digital format. Using appropriate software, WSI can be navigated on a computer monitor through various magnifications, just like a glass slide. Most of us are now familiar with the application of digital pathology in conferencing and education, multidisciplinary team discussions, remote consultations, online learning and EQA. E-slides also enables digital workflow, digital archives and integration into the e-health record, with impact on patient care. Because digital data is highly amenable to analysis, automated image analysis has been addressing the third essential component of anatomical pathology – image interpretation and diagnosis. Initial challenges include the considerable input by anatomical pathologists to annotate cells and tissue components to train machines (machine learning), ambiguity in ground-truth definition, textural variability and dimensionality. However, the expectation is being realized, that machines can establish their own patterns to interpret and act on new data, such as through deep learning which leverages artificial neural networks. There is immediate potential for AI to “value-add” to anatomical pathology practice by taking over time-consuming and tedious counting/scoring tasks such as grading of tumours and scoring of biomarkers for personalized medicine (companion diagnostics), hence improving timeliness, accuracy and reproducibility of such assessments. Nevertheless, for AI to achieve clinical utility, the pathologist has important roles in quality control, machine training, algorithm development, review of generated data and clinical decision making.

Accelerating Digital Pathology Image Analysis Powered by NVIDIA Clara
Dr Eddie Huang
APAC, NVIDIA, Singapore

Pathologists traditionally interpret dozens of slides per cancer case, searching for clues pointing to a cancer diagnosis, which works on a very manual, challenging and time-consuming process. Artificial intelligence (AI) can help pathologists become more productive by accelerating and enhancing workflow through examining massive amounts of data. AI coming with advanced process and deep learning models gives the pathologists the tools to analyze images and provide insight based on previous cases and diagnose faster by pinpointing anomalies. In NVIDIA Clara

computing platform, we provide several pipelines aids on automatic pathology nuclei segmentation and digital pathology image process operator to improves data loading with 15% ~ 22% for loading 2GB/10GB file into GPU memory by cuFile as compared with POSIX. In Clara 4 releasing, we will have the new pre-trained pathology segmentation model that can detect metastases and cuClaraImage to optimize deep learning training pipeline for building similar models by increases of GPU utilization. NVIDIA Clara is the promising GPU-accelerated solutions to AI development in digital pathology.

The Utility of Artificial Intelligence in Diagnostic Pathology

Assoc. Prof. Shahnorbanun Sahran
Center for Artificial Intelligence Technology (CAIT), Faculty of Information Science and Technology, UKM

In the digital world of transformation, the utility of artificial intelligence (AI) is a computer program used to do a particular task. The program includes a set of utilities such as diagnostics tools and can satisfy a specific need, especially in a practical way. In general, research for AI in medicine already started more than 30 years and focus more on Expert Systems. However, AI in digital pathology just started a few years back. The utility of AI in digital pathology has dramatically proven in many case studies and research collections. Pathology is the study and diagnosis of disease by examining body tissue, which is typically fixed on glass slides and viewed under a microscope. Pathology relies almost solely on glass slides to render a diagnosis. This dependency created a delay for initial diagnoses and subsequent second opinions. Therefore, physical delivery of the glass slide or specimen to the appropriate pathologist consumes time, and patient care quality is an issue. Today, the advent of whole slide imaging (WSI) allowed the pathologist to scan glass slides to produce digital images in a vast number of samples. It has the utilization of automated and, high-speed image capture systems. Glass slides can now be scanned in less than a minute and produce high-resolution digital images. As a result, AI is increasingly to assist digital pathology, enable them to process larger data sets, and perform more detailed and accurate analyses. Here, the utility will concentrate on patient-centric treatments, improve efficiency, positive changes to workflows, more accessible technology, and more time devoted to cases.

Symposium 2A

An Update on Endometrial Neoplasia

Prof. Teck Yee Khong
Women's and Children's Hospital, Adelaide, Australia

Endometrial cancer is the 6th most commonly occurring cancer in women and 15th most commonly occurring cancer overall. There were an estimated >380,000 new cases in 2018. It is mainly a disease of high-income countries, but age-adjusted rates of endometrial cancer are increasing in countries transitioning from low- to high-income economies. Endometrial cancers have been classified as being endometrioid (or Type I) or non-endometrioid (or Type 2) based on the histology. Type I cancers usually had good prognosis while Type II cancers were more aggressive. There are, however, frequent exceptions. A molecular study (The Cancer Genome Atlas) has identified 4 clusters of endometrial cancers which promise to offer better prognostic value than the dualistic model. Prognostic markers have been proposed but the mainstay of gynaecological pathology remains morphology and use of immunohistochemistry biomarkers. Issues of tumour typing, grading and staging are highlighted.

Current Issues in Gynaecological Pathology

Dr Razmin Ghazali
Department of Pathology, Hospital Kuala Lumpur, Malaysia

The classification of female genital tract tumours has evolved in leap and bounds over the last 10 years. Application of molecular testing for tumour categorisation, have proven to be more reliable and helpful. Integrated morphological and molecular classification that will have an impact on the diagnosis and management of patient is definitely the way forward. However, in laboratories with limited resources, application of molecular testing may not be feasible. Therefore, utilization of immunohistochemistry markers as a surrogate to the more expensive molecular studies can be done to stratify these tumours. The role of HPV as the precursors of lower genital tract tumours have resulted into a re-producible morphological classification of adenocarcinoma of the cervix, with or without HPV analysis. New tumour entities and changes in the terminologies of tumour used by the pathologists may resulted in confusion to the treating clinicians. Therefore, the terminologies should be consistent and universally acceptable for optimal patient's treatment and care.

Endometrial cancer - Getting Younger and Younger

Prof. Dr Nor Hayati Othman
Department of Pathology, School of Medical Sciences Universiti Sains Malaysia, Kelantan., Malaysia

Endometrial carcinoma is typically a disease of post menopausal women. The occurrences of endometrial carcinomas in younger patients are uncommon, however of late we are seeing increasing number of cases in young women. The possible reasons are due to increasing trend of obesity in our population and due to exposure to xeno-estrogens, artificial estrogens found in processed foods and cosmetics. Obesity is predominantly associated with type 1 endometrial cancers as compared to type 2 endometrial cancers. The risk of endometrial cancer is increased in women with a body mass index (BMI) greater than 30 kg/m^2 and the risk increases linearly with increasing BMI. Endometrial carcinoma in women less than 40 pose challenges in fertility preservation especially in nulliparous women. Diabetes, obesity, excessive exposure to xenooestrogen are among the potential causes of excessive oestrogen stimulation.

Symposium 3A

Not Just the Mucosa...New Challenges and Pitfalls in the Neuromuscular Structures of the Bowel Wall

Prof. Jo Martin

Professor of Pathology, Queen Mary University of London, *Hon. Consultant Barts Health NHS Trust*

Dysmotility of the intestine ranges from mild and temporary, to severe, disabling and potentially fatal. Many pathologists are unfamiliar with the range of pathology that can be present in the neuromuscular structures of the bowel wall in conditions such as pseudoobstruction, constipation and megarectum. We have previously shown, in a multinational study, that 70% of diagnoses may be missed due to the limited histopathological assessment of cases.

This talk will cover the approach to examination of biopsy samples and resection specimens from patients with these conditions, the special and immunohistochemical stains that are key in examination, and the range of developmental, myopathic and neuropathic features that may be present, and will include key studies and illustrative case examples.

Molecular Update on Astrocytoma

Prof. Wong Kum Thong

Department of Pathology, Faculty of Medicine, University Malaya, Malaysia

With the publication of the latest revision of the WHO classification in 2016, brain tumour genetics in gliomas and other tumours, have been given much greater importance and role in definitions of tumour entities. In addition, molecular signatures have impacted on prognosis and response to certain therapies. Important advances include the IDH mutations, 1p/19q co-deletion and the changing role of MGMT. In this seminar, the recent discoveries and advances in genetics in the various types and grades of astrocytomas shall be highlighted and their relevance discussed.

Frontiers in Molecular Diagnostics: Solid Tumour and Cancer Genetics

Dr Roziana Ariffin

Consultant Genetic Pathologist and Head of Pathology Department, Hospital Tunku Azizah, Kuala Lumpur

Focus mainly on application of NGS (Next Generation Sequencing) for oncology specifically solid tumour. Brief review on cancer genomic targets, NGS, assay design consideration and limitations. Basic workflow of NGS is outlined. NGS based assay includes Targeted Gene Panel testing, WES (Whole Exome Sequencing), WGS (Whole Genome Sequencing), RNA sequencing, Methylome sequencing and Chromatin Immunoprecipitation & sequencing. A quick review of comparison between amplicon based platform versus hybrid capture. Brief concept of depth and coverage in various assay targets of NGS will be discussed. Variant interpretation explained with understanding that it is not easy to differentiate between germline and somatic mutation as sometimes they can be somatic and germline at the same time. Applicability of WES reviewed and ESMO (European Society of Medical Oncology) recommendation on use of NGS in the diagnosis of solid tumor and future trends /challenges in personalised tumour management is addressed.

Symposium 4A

Intraductal Carcinoma of the Prostate: Facts and Controversies
Prof. Brett Delahunt
Department of Pathology and Molecular Medicine, Wellington School of Medicine and Health Sciences, University of Otago, Wellington, New Zealand

High-grade prostatic adenocarcinoma involving duct/acinar structures is labelled intraductal carcinoma of the prostate (IDCP) and was first recognized as spread of cancer into ducts in 1909. More recently the concept has arisen that some IDCP may represent an *in situ* lesion which has given rise to differing recommendations regarding the reporting of IDCP in prostate biopsies and radical prostatectomy specimens. The current recommendations from the International Society of Urological Pathology are that, when associated with invasive cancer, the grade of IDCP should be incorporated into the Gleason Score, although this is challenged by some groups. The ISUP also recommends that IDCP seen in the absence of invasive carcinoma be not graded. The definition of IDCP, as endorsed by the 2016 WHO Bluebook, is a further source of controversy as it is stated that cases of IDCP with papillary or loose cribriform architecture without comedonecrosis should have cells with ≥6x nuclear enlargement. It is unclear how this size criterion was derived and which of the parameters of nuclear size (nuclear diameter, nuclear surface area or nuclear perimeter) it relates to. Recent studies have raised doubts regarding the validity of this diagnostic feature. As numerous studies have shown that IDCP is associated with high stage disease with a significant negative impact on cancer-specific survival, accurate diagnosis is crucial to ensure appropriate patient management. Failure to recognize IDCP, particularly in needle biopsies, could lead to delays in the treatment of aggressive high grade prostate cancer, resulting in cancer progression and sub-optimal patient outcomes.

Prognostification of Low Grade Lymphoma by Molecular Subtyping
Dr. Noraidah Masir
Department of Pathology, Prince Court Medical Centre, Kuala Lumpur, Malaysia

Low grade lymphomas represent more than half of malignant lymphomas and include small lymphocytic lymphomas, lymphoplasmacytic lymphoma, follicular lymphomas and marginal zone lymphomas. Advancements in the molecular genetics of these tumours has led to better understanding of pathogenesis. This in turn allows more refined tumour classification and stratification based on the molecular subtypes found. This development has significant implications in the management, prediction of the biological behaviour and response of tumour to treatment.

Molecular Characterisation of High Grade B Cell Lymphoma for Diagnosis and Prognosis
Dr. Noraidah Masir
Department of Pathology, Prince Court Medical Centre, Kuala Lumpur, Malaysia

Diffuse large B-cell lymphoma (DLBCL), the most common subtype of non-Hodgkin lymphoma, is characterized by both clinical and molecular heterogeneity. The past decade has witnessed a dramatic expansion of our understanding of the genomic underpinnings of this disease, especially with the application of next-generation sequencing. Current genomic landscape of DLBCL and how this information provides a potential molecular framework for precision medicine-based strategies in this disease.

Symposium 5A

Update in the Pathology of Fatty Liver

Prof. Huang Shiu Feng
Institute of Molecular and Genomic Medicine, National Health Research Institutes Miaoli, Taiwan

The pathology of fatty liver disease is mainly divided into 3 categories, which includes: a. Fatty liver (simple steatosis): mainly macrovesicular fatty change, b. Steatohepatitis, c. cirrhosis. The classic histologic features of steatohepatitis include fatty changes, lobular inflammation and hepatocyte necrosis, which are most prominent in the centrilobular region of the hepatic lobules and perivenular fibrosis. Hepatocytes usually have ballooning change. The inflammatory cell infiltrate, located primarily in the sinusoids and around the necrotic hepatocytes, consists of mononuclear cells and polymorphonuclear cells. In addition to inflammation and necrosis, Mallory body formations is another characteristic feature. Patients with NASH can progress to cirrhosis has been confirmed by series of biopsies, which demonstrated that the diagnostic features of NASH may no longer exist by the time with cirrhosis. Thus, cryptogenic cirrhosis was used interchangeably with NASH-related cirrhosis by some authors. For patients with fatty liver, the only means of proving a diagnosis of NASH and separating it from simple fatty liver is a liver biopsy. If the tissue shows fat without inflammation and damage, simple fatty liver or NAFLD is diagnosed. An important piece of information learned from the biopsy is whether scar tissue has developed in the liver (pericellular and perisinusoidal fibrosis). Currently, no blood tests or scans can reliably provide this information, either for alcoholic or non-alcoholic fatty liver.

Early Pregnancy Loss and Pregnancy of Unknown Location

Prof. Teck Yee Khong
Women's and Children's Hospital, Adelaide, Australia

An approach to histopathology of early pregnancy is presented. The clinical contexts are induced abortion or termination of pregnancy, spontaneous abortion or miscarriage, pregnancy of unknown location and ectopic pregnancy. Hydatidiform molar pregnancies, while being also a form of early pregnancy loss, will not be discussed. The rate of miscarriage varies according to the gestational age. The loss of a pregnancy needs a structured investigation including history, examination, testing of uterine anomalies, endocrine, immunological disorders and also genetic tests as well as histological examination of the products. The pathologist's role in examining the products of conception after such a loss is to try to identify a cause and especially those cases with a recurrent cause. For induced or voluntary terminations of pregnancy, a prudent policy is to identify any gestational tissue obtained to verify an intrauterine pregnancy and successful termination. Whether tissue from all cases need to be examined is discussed. Tissue is often sent with a request for an urgent diagnosis for a pregnancy of unknown location. How such tissues should be managed is discussed. The pathology of ectopic pregnancy is presented also to highlight its similarity to placenta accreta

The National Biobank Consortium: Relevance, Needs and Strategies

Professor Datuk Dr. A. Rahman A. Jamal
MD, MRCP, PhD, GDHM, FASc, PJN, DPNS, ANS
Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

A biobank stores biological samples, usually human, for use in research. High quality research requires high quality biospecimens. In the past decades many biobanks have emerged in most countries including Malaysia. There are large consortiums of biobanks that brings together the main players from the biobanking field and focusing on research collaboration. In Malaysia, there are many small, medium and large scale biobanks located in the universities, research institutions and also hospitals. For Malaysia to be competitive in research, we need to bring together these biobanks under one platform. As a nation, we also need to contribute data from a large number of samples to be part of international research consortiums. For rare diseases and rare cancers, the need to bring together these biobanks become even more crucial. An ideal approach is to have a national biobank which will provide biobanking services to all, with minimum fees. This will be more cost effective than having many biobanks. Governance and policies on access and data sharing will need to be put in place. The other approach is to set up a consortium of biobanks that will link all existing biobanks. A steering or membership committee will be setup to manage and govern this consortium. Harmonisation of protocols and also the sharing of databases from each biobank will be a good start. The National Biobank Consortium will be a good base to start for consolidating our medical research and link our Malaysian researchers to many research consortiums and collaboration.

Chemical Pathology

Symposium 1B

Cardiac Biomarkers of Acute Coronary Syndrome: A Historical Perspective
Assoc. Prof. Dr. Thuhairah Hasrah Abdul Rahman
Deputy Dean (Research & Innovation), Faculty of Medicine, Universiti Teknologi MARA; Consultant Chemical Pathologist, Department of Clinical Diagnostic Laboratories, Hospital UiTM, Malaysia.

The need for rapid and accurate diagnostic algorithms to diagnose patients with acute coronary syndrome (ACS) is vital to initiate a more effective evidence-based medical management. Clinical assessment, 12-lead ECG and cardiac markers such as troponin (cTn) have become the diagnostic foundations of patients presenting with acute onset chest pain. The role of cardiac markers as a diagnostic tool of ACS has evolved over the years where technological advancements have made contemporary sensitive and high-sensitivity cardiac troponin (hscTn) assays into a highly accurate diagnostic tool in patients with acute chest pain in comparison with conventional cardiac biomarkers. From the time of non-specific cardiac markers such as aspartate transaminase, lactate dehydrogenase in the 1960s and 1970s to the initial 1st-generation assays and now 5th-generation high-sensitivity cardiac troponin (hs-cTn) assays, this presentation will embark on the history and evolution of cardiac biomarkers with particular emphasis on hs-cTn. This talk will further discuss on the current evidence and guidelines of using hs-cTn in clinical practice.

Biochemical Markers for Non-alcoholic Fatty Liver Disease
Assoc. Prof. Dr Pavai Sthaneshwar
Associate Professor, Department of Pathology, Faculty of Medicine, University of Malaya

Fatty liver is a common histologic finding in human liver biopsy specimens. Nonalcoholic fatty liver disease (NAFLD) is estimated to affect approximately 1 billion individuals worldwide. NAFLD represents a spectrum of diseases, ranging from simple fatty liver (steatosis) to steatosis with inflammation and necrosis to cirrhosis that occurs in people who drink little or no alcohol. Nonalcoholic steatohepatitis (NASH) represents the more severe end of this spectrum and is associated with progressive liver disease, fibrosis, cirrhosis and liver-related morbidity and mortality. The major risk factors are obesity and insulin resistance, and the prevalence of these risk factors has increased rapidly throughout the world. Until now, liver biopsy has been the gold standard for identifying these disorders, but has well-known limitations, including invasiveness; rare but potentially life-threatening complications; poor acceptability; sampling variability; and cost. Furthermore, due to the epidemic proportion of individuals with NAFLD worldwide, liver biopsy evaluation is impractical, and non-invasive assessment for the diagnosis of NASH and fibrosis is needed. The inability of liver biopsy to meet this challenge makes the development of non-invasive, readily available, and easy-to-perform serum markers a high priority. Recently adipocytokines markers have gained considerable attention. However, no single marker is helpful for diagnosis and staging of the disease, but applying a panel including different types of tests may be more useful.

New Biomarkers in Diabetes Mellitus

Assoc. Prof. Dr. Wong Moh Sim

Head and Senior Consultant Chemical Pathologist, Department of Laboratory Medicine, Khoo Teck Puat Hospital, Singapore

Diabetes mellitus is a group of metabolic diseases characterised by hyperglycaemia caused by defects in insulin secretion, insulin action or both. The global prevalence of diabetes mellitus, especially Type 2 diabetes, is increasing rapidly. Diabetes is associated with macrovascular complications such as cardiovascular disease and stroke as well as microvascular complications such as retinopathy and nephropathy. Diagnosis and monitoring of diabetes is currently achieved by using the traditional markers of glucose and HbA1c. Biomarkers have been proposed to facilitate early and precise diagnosis of diabetes and prediction of diabetes complications. A biomarker is a biomolecule/biological state that can be used for the prognosis, diagnosis, and follow-up of the pathological state or the severity of a disease. Emerging biomarkers include microRNAs, proteins and metabolites. These new biomarkers have the potential to improve individual risk assessment in diabetes mellitus and ultimately the management of the patient.

Symposium 2B

Experience Sharing in Establishing POCT
Assoc. Prof. Dr Wong Moh Sim
Head and Senior Consultant Chemical Pathologist, Department of Laboratory Medicine, Khoo Teck Puat Hospital, Singapore

Yishun Health comprises both Khoo Teck Puat Hospital (KTPH), a 690-bed acute care general hospital, and Yishun Community Hospital located in the northern part of Singapore. The Point of Care Testing (POCT) programme was implemented in 2002 in our previous hospital, Alexandra Hospital, prior to our move to KTPH in 2010. There are currently 13 POC tests in Yishun Health. The POCT Committee oversees the use of POCT devices and ensures user competency to meet licensing and accreditation requirements, provides a forum for discussion of ideas and approaches from stakeholders, and facilitates implementation of universally acceptable solutions and project activities. Devices with connectivity capability, where available, are interfaced to the Laboratory Information System (LIS) and the Electronic Medical Records (EMR) to facilitate the timely dissemination of results to users. Regular training and engagement sessions ensure competency and commitment from the staff performing the tests. We will share our POCT experience in this talk.

Point of Care Testing and Clinical Governance in Malaysia
Datin Dr Baizurah Mohd Hussain
Consultant Chemical Pathologist, Malaysia

Point of Care Testing (POCT)/Near Patient testing/Bedside testing is defined as a laboratory testing done by a non-medical laboratory technician, for example physicians, nurses or medical assistants outside a dedicated laboratory. We are all familiar with the Clinical Governance system through which healthcare organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care and the framework pillars. In Pathology, governance has been our stronghold as to bread and butter. POCT, on the other hand, is directly part of the clinical pathway. Clinicians utilise the results for immediate treatment and management of patients. This presentation shows how we try to apply Clinical Governance using the same tools in the pathology laboratory in Malaysia.

Impact of POCT in Clinical Decision Making
Assoc. Prof. Dr Wong Moh Sim
Head and Senior Consultant Chemical Pathologist, Department of Laboratory Medicine, Khoo Teck Puat Hospital, Singapore

Point-of-care testing (POCT) is defined as 'testing that is performed near or at the site of a patient with the result leading to a possible change in the care of the patient' [College of American Pathologists (CAP)]. POCT tests include tests for the measurement of glucose, HbA1c, arterial blood gases and coagulation markers. POCT is an integral part of patient-centred care today. The tests are typically performed by non-laboratory personnel and as such, POCT guidelines from various international bodies, including ISO and CAP, are readily available. The standards define governance structure, roles and responsibilities of POC testing personnel, analytical quality (including selection of appropriate test methods and validation protocols), quality management, data management, and training and competency. Clinical laboratories overseeing POCT in their respective organisations should comply to these standards, to mitigate the risk of patient harm which may result from suboptimal POCT practices.

Symposium 3B

Laboratory Testing in Thyroid Conditions - Pitfalls and Clinical Utility
Prof. Dato' Dr Mafauzy Mohamed
Senior Consultant Endocrinologist, Hospital Universiti Sains Malaysia, Universiti Sains Malaysia

Laboratory tests for thyroid conditions includes thyroid-stimulating hormone (TSH), free thyroxine (fT4), free triiodothyronine (fT3), thyroglobulin (Tg), thyroglobulin antibodies (Tg-Ab), thyroid peroxidase antibodies (TPO-Ab), TSH receptor antibodies (TRAb) and calcitonin. TSH, fT4 and fT3 tests are used to determine functional status of the thyroid gland. TPO-Ab and Tg-Ab are used in diagnosing Hashimoto's thyroiditis. TRAb tests are used to diagnose Graves' disease. Tg and calcitonin are important tumor markers used in assessing activity of differentiated thyroid carcinoma (DTC) and medullary thyroid carcinoma (MTC), respectively. It is important to be familiar with the possible pitfalls in the use of these tests so that they can be interpreted properly and accurately. Many factors can interfere with laboratory tests such as human anti-animal antibodies. Certain medications can also interfere with thyroid function tests (TFT) e.g., salicylates, lithium, amiodarone. In pregnancy, normal changes in thyroid physiology and the postpartum period can make TFT interpretation challenging. In non-thyroidal illnesses e.g., critically ill patients, TFT is also affected. Hence when results are discordant, it is important to consider the clinical context when interpreting results.

Bone Health and Cardiovascular Risk Factors
Assoc. Prof. Dr Subashini C. Thambiah
Consultant Chemical Pathologist, Department of Pathology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

Both cardiovascular disease (CVD) and osteoporosis are associated with increased morbidity and mortality with significant economic burden, particularly in an ageing population. Several epidemiological studies have demonstrated that these two conditions are closely related, suggesting a possible link in their pathogenesis. Both share similar risk factors such as smoking, alcohol, menopause status and physical inactivity. The potential association between CVD and osteoporosis has important health implications for individuals with (or at risk for) these conditions. This presentation will discuss the possible associations between these chronic conditions. Understanding these is significant for the prevention and management of CVD and osteoporosis.

Data Interpretation of Endocrine Cases
Dr. Leslie C Lai
Consultant in Metabolic Medicine, Gleneagles Hospital Kuala Lumpur, Malaysia

This talk will include data interpretation covering disorders of the pituitary and adrenal glands as well as islet cell tumours. It will also include disorders of water and sodium homeostasis. Appropriate dynamic function test results will be discussed. It is hoped that by the end of the talk the participants will have more confidence in interpreting biochemical data and dynamic function test results in the endocrine conditions covered by this talk.

Symposium 4B

Patient-Based Real-Time Quality Control: Review and Recommendations
Dr Loh Tze Ping
Consultant and Research Director at Department of Laboratory Medicine, National University Hospital, Singapore

Patient-based real time quality control (PBRTQC) is a laboratory quality control practice that harnesses patient data for monitoring of performance of the analytical system. It has recently gained renewed interest with increasing sophistication in the underlying algorithms as well as the software supporting such practice. In this talk, we will walk through the general concepts of PBRTQC and recommendations surrounding the implementation in routine clinical laboratories.

Indirect Reference Range Establishment
Dr Loh Tze Ping
Consultant and Research Director at Department of Laboratory Medicine, National University Hospital, Singapore

Reference intervals are the most commonly used tool assisting a clinician interpreting a quantitative laboratory result. Traditionally, reference intervals are derived by measuring the biomarker of interest in a representative reference population and calculating the statistical boundary for a central subpopulation. More recently, the testing of laboratory tests in large patient populations has opened up the possibility of deriving reference intervals from routine clinical laboratory database - the indirect approach. In this talk, we will walk through key concepts related to indirect reference intervals and its application in routine clinical laboratory.

Delta Checks in Clinical Laboratory
Dr Loh Tze Ping
Consultant and Research Director at Department of Laboratory Medicine, National University Hospital, Singapore

Delta check is a verification rule that is applied to identify sequential laboratory results with larger than expected variation, which may be indicative of an error. Delta check is a powerful tool in the repertoire in the laboratory quality system as it detects error at individual patient level. In this talk, we will walk through the key concepts in delta check, including recently developed theories and tools, to allow laboratory practitioners to set up objective delta check rules with a priori defined performance characteristics.

Symposium 5B

LC-MS/MS Technology and Applications in the Clinical Lab
Dr Fionn B Quinlan
APAC Division, Waters Corp, Taipei, Taiwan

After decades of being seen as a complex technology more suited for research areas, Liquid Chromatography Mass Spectrometry has steadily been making in-roads into Clinical and Toxicology laboratories worldwide. This trend has accelerated over the last decade. Learn why it's often become the platform of choice for areas such as Expanded Newborn Screening, Endocrinology, Therapeutic Drug Monitoring and Clinical Toxicology. Even for Coronavirus viral load quantitation, LC-MS/MS now offers an alternative technique to PCR. By integrating sample prep automation systems, robotic handling, LIMS and rapid instrument set-up and self-calibration, this technology is getting easier to implement every day. Seamless sample to report output is now becoming a reality.

Application of LCMS/MS in Newborn Screening
Dr Salina Abdul Rahman
IEM & Genetic Unit, Institute for Medical Research, NIH, Setia Alam, Malaysia

The development and introduction of electrospray ionization into the LCMS/MS system has embarked a new technology for newborn screening purposes. Newborn screening using tandem mass spectrometry from dried blood spots was first proposed by Millington et al in 1990. MS/MS is capable of identifying and quantifying many metabolites in a single run within less than two minutes. It is robust, sensitive and specific that enables it to screen multiple disorders simultaneously from one dried blood spot for Inborn Errors of Metabolism (IEM). IEM is a group of heritable disorders which may present as emergency cases and can cause death if not treated promptly. Screening of newborn for IEM before they become symptomatic allows early diagnosis and treatment of affected neonates, resulting in normal growth and development and reduction of financial costs for families and society. Due to advances in technology and treatment, more disorders are proposed to be included in newborn screening. In conclusion, mass spectrometry provides a rapid, sensitive, and specific screening method that ultimately gives clinical laboratories ability to measure and screen many disorders for early diagnosis and treatment.

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Haematology and Transfusion Medicine

Symposium 1C

Advantages of IPSC Generated MSC
Prof. John Rasko, Australia
Professor of Medicine, University of Sydney, Australia

Use of banked cord blood to create a clinically compliant iPSC Masterbank for potential cellular therapies
Assoc. Prof. Dr Ngaire Elwood
BMDI Cord Blood Bank & Cord Blood Stem Cell Research Laboratory, Murdoch Children's Research Institute, Parkville, Australia

We aim to establish a bank of clinical grade induced pluripotent stem cell (iPSC) lines from banked unrelated CB. CB stored within the BMDI Cord Blood Bank (CBB) has met strict donor eligibility and quality requirements and is therefore an ideal source of well-characterised, Good Manufacturing Practice (GMP)-grade starting material for the creation of iPSCs. To this end, we have stablished an Animal Component Free protocol to generate iPSC lines from 50 µl of cryopreserved CB buffy coat, using defined reagents manufactured under GMP. Thawed CB cells are expanded in culture prior to reprogramming using the non-integrating Sendai Reprogramming system. iPSC colonies are picked and cell lines then maintained long-term under xeno-free conditions. Karyotype integrity of the generated iPSC lines is confirmed and flow cytometry used to show that iPSCs express known pluripotency markers. In vitro differentiation experiments indicate that cord blood derived iPSCs can differentiate into cells representing the 3 germline lineages: beating cardiac cells (mesoderm), neuronal cells (ectoderm) and endodermal precursor cells. CB donors with common homozygous HLA haplotypes have been identified and we are currently in the process of re-consenting these donors to create and store GMP-compliant iPSC lines from a fraction of their stored CB. Appropriate Quality Assurance parameters have been established to ensure the safety and quality of the lines produced. Once manufactured, we believe this bank of clinical grade iPSCs will be an important source of stem cells to derive cells for therapeutic use.

CAR T-cell Therapy: A New Era in Cancer Immunotherapy
Dato' Dr Chang Kian Meng
Senior Consultant Haematologist and Transplant Physician, *Sunway Medical Centre, Malaysia*

Chimeric antigen receptor T (CAR-T) is an innovative immunotherapy in the treatment of malignancies.The current CD19-CAR-T is approved for the therapy of refractory/relapsed B-cell ALL and B cell lymphomas. A high remission rate of 60 – 90% can be achieved in some cases that have even failed autologous or allogeneic transplantation.
CAR-T cells are produced by transducing a genetically engineered CAR fusion protein into T cells by means of a retrovirus or lentivirus. The recognition of tumor cells by the CAR molecule overcomes the evasion of tumor by HLA loss. A CAR construct consists of a single-chain variable fragment (scFV) antigen-recognition domain, a CD3-derived T cell activation domain and a co-stimulatory domain (CD28 or 4-1BB). The first-generation CART however had poor responses due to poor activation and limited persistence but the addition of the co-stimulatory domain has

improved this problem with more potent cytotoxic activity, longer persistence and memory T-cell formation.

The use of CAR-T cells is most successful in haematological malignancies and less in solid organ tumours. There are still many unresolved issues including upscaling the manufacture and production of commercial CAR T cells, affordability, regulation and ensuring quality control for institution-made products. At the clinical level, there is a learning curve on managing the acute phase toxicity including cytokine release syndrome, immune effector cell associated neurotoxicity syndrome, the protracted cytopaenia, macrophage activation syndrome as well as tumour lysis syndrome. The long-term toxicities remain to be elucidated with longer experience and survival of patients. These include prolonged B cell aplasia, T cell deficiency, infections and long term impairment of memory and fatigue. There are still limitations to this therapy including loss of the CAR-T cells after a few months as well as tumour escape and tumour relapse involving the loss of CD-19 expression.

Some of the new developments include the manufacture of double antigen CAR-T (expressing both anti CD19 and anti CD20), the third and fourth generation CAR-T and the combination of CAR-T therapy with checkpoint inhibitors, and other immunomodulators. There are also issues with T cell harvesting in patient who have undergone multiple cycles of therapy with poor T cell quality. This can be overcome with the development of off-the-shelf CAR T (allogeneic CAR T) and CAR NK cells.

Symposium 2C

Haematology Parameters in Infections, Practicality & Trend
Prof. Dr Ida Parwati
Department of Clinical Pathology, Dr. Hasan Sadikin General Hospital, Faculty of Medicine Universitas Padjadjaran, Bandung, Indonesia

Peripheral blood as a minimally invasive source has been widely used as biomarker for many diseases. In the case of infection, when the microbiological examination takes a long time and is more expensive, the hematology examination can be immediately used as a screening tools. Each cell such as RBC, neutrophils, lymphocytes, monocytes, platelets has a specific role in infectious diseases. The classically used hematologic parameters are the number of leucocytes and the differential count. Using modern hematology analyzer, hematological parameters, such as white blood cell (WBCs) and their subpopulations, red cell distribution width (RDW), mean platelet volume (MPV), and plateletcrit (PCT), and derived biomarkers such as neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and monocyte-to-lymphocyte ratio (MLR), are easily measured at low cost. These parameters are widely used for risk stratification, diagnosis, prediction of disease severity and determination of prognosis. A combination of multiple parameters with measuring phenotypic changes in activated leukocytes contain such as lipid rafts in their cell membrane and altered intracellular DNA/RNA levels can be used as novel diagnostic algorithm for different infectious diseases called Infectious Management System (IMS). Early diagnosing of infection in a timely manner at low cost can improve infection management and reduce unnecessary antibiotics usage.

Artificial Intelligence: The future in Haematology Diagnostics
Prof. Dr. N. Veera Sekaran
Universiti Tunku Abdul Rahman, Malaysia

Illustrative cases in Multicolour Flowcytometry
Dr Mimi Azura Aziz
Pathology Department, Hospital Tunku Azizah (WCHKL), Kuala Lumpur, Malaysia
Immunophenotyping using flow cytometry has become the method of choice in identifying and sorting cells within liquid suspension. It has wide usage in laboratory services for haematological diseases. Flow cytometric immunophenotyping allows comprehensive assessment of both surface and intracellular cell antigens. The new generations flow cytometry enables rapid analysis of massive cell volumes. The phenotypic capabilities of flow cytometric immunophenotyping facilitate the identification of cell population, identification of potential therapeutic target, prediction of genetic lesion and detection of rare cells. The cases presented will be illustrating some of these flow cytometric immunophenotyping functions in our clinical flow cytometry lab.

Symposium 3C

Parallel bimodal single-cell sequencing of transcriptome and chromatin accessibility
Dr Jonathan Loh
Institute of Molecular and Cell Biology, Singapore

Joint profiling of transcriptome and chromatin accessibility within single cells allows for the deconstruction of the complex relationship between transcriptional states and upstream regulatory programs determining different cell fates. Here, we developed an automated method with high sensitivity, assay for single-cell transcriptome and accessibility regions (ASTAR-seq), for simultaneous measurement of whole-cell transcriptome and chromatin accessibility within the same single cell. To show the utility of ASTAR-seq, we profiled 384 mESCs under naive and primed pluripotent states as well as a two-cell like state, 424 human cells of various lineage origins (BJ, K562, JK1, and Jurkat), and 480 primary cord blood cells undergoing erythroblast differentiation. With the joint profiles, we configured the transcriptional and chromatin accessibility landscapes of discrete cell states, uncovered linked sets of cis-regulatory elements and target genes unique to each state, and constructed interactome and transcription factor (TF)-centered upstream regulatory networks for various cell states.

NGS in Thal diagnosis
Prof. Vip Viprakasit
Division of Paediatric Haematology/Oncology, Department of Paediatrics and Thalassaemia Centre, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Prenatal diagnosis of haematological disorder
Prof. Vip Viprakasit
Division of Paediatric Haematology/Oncology, Department of Paediatrics and Thalassaemia Centre, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Symposium 4C

Understanding of MDS/MPN based on pathogenesis & approach to diagnosis
Prof. Dr Raja Zahratul Azma Raja Sabudin
Department of Pathology, Faculty of Medicine, Universiti Kebangsaan Malaysia

Myelodysplastic syndrome/myeloproliferative neoplasm is a group of chronic clonal myeloid malignancies with overlapping features of both myelodysplastic syndrome and myeloproliferative neoplasm at the time of presentation. These overlapping features complicates the diagnosis of patient with myelodysplastic syndrome/myeloproliferative neoplasm. This group includes the entities chronic myelomonocytic leukemia, juvenile myelomonocytic leukemia, BCR-ABL1 negative atypical chronic myeloid leukemia, myelodysplastic syndrome/myeloproliferative neoplasm with ring sideroblasts and thrombocytosis and myelodysplastic syndrome/myeloproliferative neoplasm, unclassifiable. Advancements in next generation sequencing have begun to reveal the molecular abnormalities of these diseases, identifying an array of recurrently mutated genes involved in epigenetic regulation, RNA splicing, transcription, and cell signaling. Mutually exclusive gene combinations have been observed between specific subtypes of patients with myelodysplastic syndrome/myeloproliferative neoplasm that have an impact on patient outcomes, including TET2-SRSF2 in chronic myelomonocytic leukemia, ASXL1-SETBP1 in atypical chronic myeloid leukemia, or SF3B1-JAK2 in myelodysplastic syndrome/myeloproliferative neoplasm with ring sideroblasts and thrombocytosis. The understanding of the pathogenesis of these clonal myeloid malignancies will provides aid in determine their prevalence, diagnosis and surveillance. Development of targeted therapy in near future will also help in improvement of their survival.

NGS for MRD Detection in Acute Leukaemia
Prof. Dr Rosline Hassan
School of Medical Sciences, Universiti Sains Malaysia

The purpose of Measurable residual disease (MRD; also referred to as minimal residual disease) testing is to determine the clearance of disease following chemotherapy or stem cell transplant. Different methods are available to follow up patients with Acute Leukemia.
MRD can be assessed by flow cytometry and few molecular techniques. The molecular methods have been dramatically improved over the last 20 years, paralleled by a significant knowledge growth in the molecular aspect of acute leukemia. There are 2 general approaches to molecular MRD assessment: real-time PCR-based approaches and sequencing approaches wherein sequences from individual DNA/complementary DNA (cDNA) molecules are generated.

The PCR approach includes classical real-time qPCR using fluorescent probes, and digital PCR. This approach is usually of high sensitivity and therefore currently considered the gold standard. However, its applicability is limited to the ∼40% of AML patients that have specific translocation or mutation. Theoretically, NGS for MRD assessment can be applied to all subtypes of AML and with the improvement in bioinformatics approaches, it is applicable for those leukemia without specific translocation or mutation.

Next-generation sequencing (NGS) can simultaneously detect various mutations and be applied to the majority of patients with Acute Leukemia. Recently, it was shown that NGS MRD of mutants other than the common mutations occurring in clonal hematopoiesis, including the DTA (*DNMT3A*, *TET2*, and *ASXL1*) mutations, carry prognostic impacts on relapse rates and overall

survival (OS) in AML patients. However, the proper time point for NGS MRD detection after treatment is still unclear. It is hypothesized that NGS MRD detected at different time points might have different clinical implications. In acute lymphoblastic leukemia, with this high-throughput NGS technology, a more in-depth analysis of *IG* and/or *TCR* gene rearrangements will be able to reach. In conclusion, standardization, quality control, and validation of this new technology as a tool for MRD in acute leukemia are warranted prior to its incorporation into clinical routine practice.

Liquid biopsy: The future in Haemato-Oncology Diagnosis

Dr Yuslina Mat Yusoff
Haematology Unit, Cancer Research Centre, Institute for Medical Research, Kuala Lumpur

In the era of precision medicine, 'liquid biopsy' is increasingly being studied as a potential tool for refining diagnosis and disease monitoring. The term "liquid biopsy" means accessing circulating tumour cells or tumour DNA through a blood sampling, without the need of an invasive tissue biopsy. In 1977, scientists identified the presence of abnormally high levels of cell-free DNA (cfDNA) in the plasma and serum of cancer patients relative to health control patients and this cfDNA was presumed to represent mainly circulating tumor DNA (ctDNA).

Liquid biopsy has promising clinical utility in haemato-oncology particularly lymphomas. Today, the management of lymphoma is typically guided by the results of a needle biopsy at diagnosis, then monitoring through and after chemotherapy treatment by PET-CT scans. However, this relies on the presence of macroscopic tumour burden in order to detect areas of lymphoma involvement. Due to this limitation, patients can be incorrectly labelled as having a complete remission even though microscopic disease may still be present.

Furthermore, limitation in accessing fresh tumour material from tissue biopsies has prevented the rapid translation of lymphoma gene mutations into prognostic or predictive tools for clinical practice. Recent studies have demonstrated the use of ctDNA assessment across many lymphoma subtypes. Compared with conventional tissue biopsy or other commonly used complex imaging techniques, liquid biopsies have a lower risk and relatively easy to operate. Latest update on liquid biopsy including its clinical utility, technical issues, standardization and limitations will be discussed.

Symposium 5C

Patient Blood Management in Malaysia: Challenges and Way Forward
Dr Nor Hafizah Ahmad
Clinical Transfusion Division, National Blood Centre, Kuala Lumpur

Patient Blood Management (PBM) is the timely application of evidence-based medical and surgical concepts designed to maintain hemoglobin concentration, optimize hemostasis and minimize blood loss in an effort to improve patient outcome. This clinical practice started to be implemented in surgical patients and currently it has been expanded for clinical use in medical department. The primary concepts of PBM are: (1) optimizing red cell mass, (2) minimizing blood loss and (3) maximising patients' tolerance of anaemia. *(Isbister, James P. 2013)*. Literatures have shown that peri-operative morbidity and mortality are markedly reduced for patients whose hemoglobin are well optimized before surgery and when restrictive transfusion practice were being practiced. The success of PBM implementation requires a holistic and multidisciplinary approach with contribution from all levels involved. Setting up a national framework, empowerment of early anemia recognition and treatment at the primary care centres, implementation of PBM clinical practice at hospital levels, having a national guideline and also continuous education or awareness program in undergraduate and post graduate training which shall be focused on to build a strong foundation towards the success of implementation of PBM in Malaysia.

Non-homologous use of cord blood
Assoc. Prof. Dr Ngaire Elwood
BMDI Cord Blood Bank & Cord Blood Stem Cell Research Laboratory, Murdoch Children's Research Institute, Parkville, Australia

The BMDI Cord Blood Bank (CBB), one of three public cord blood banks in Australia, has released nearly 600 CBU for treatment of patients with leukaemia and other blood disorders; cord blood (CB) is an important donor source for bone marrow transplant. The CBB is licensed by the Therapeutic Goods Administration (TGA) and holds international accreditation through the Foundation for the Accreditation of Cellular Therapy (FACT). CB stored within the bank has met strict donor eligibility and quality requirements and has a high success of donor follow-up. Banked CB is therefore an ideal source of well-characterised, GMP-grade starting material for non-homologous clinical use beyond bone marrow transplant. We have been exploring the use of CB for cellular therapies involving cardiac and neurological repair. We have also been exploring the use of banked CB as the ideal starting material to create GMP-grade induced pluripotent stem cell (iPSC) lines from donors with a homozygous haplotype (ie. 'super-donors'). To this end we are able to generate stable iPSC lines from stored CB under "GMP-like" conditions. Once manufactured, we believe this bank of clinical grade iPSCs will be an important source of stem cells to derive cells, such as nerve, cardiac and T-cells, for potential therapeutic use. Looking towards the future, public unrelated CBBs will play a key role in provision of CB for regenerative and immuno-therapies, thereby value-adding to the vital role the banks already serve for the bone marrow transplant community.

Passenger lymphocyte syndrome

Assoc. Prof. Dr Nurasyikin Yusof
Department of Pathology, Faculty of Medicine, Universiti Kebangsaan Malaysia

The passenger lymphocyte syndrome (PLS) refers to the clinical phenomenon of alloimmune haemolysis resulting from the transfer of viable lymphocytes from donor during hematopoietic stem cell transplant and solid organ. It is caused by donor B lymphocyte production of antibodies causing a primary or secondary immune response to recipient erythrocytes. Most commonly, it is in the setting of minor ABO mismatches. Sometimes, it is very severe and may cause "unexplained" haemolysis post transplantation. It is a recognised complication of minor incompatibility but the incidence of haemolysis associated with this is waning because anti-B-cell immunosuppressive therapy is increasingly a component of graft versus host disease prophylaxis. The impact of ABO mismatching on stem cell recipient survival remains as an area of research interest. Clinicians must be vigilant in order to recognize haemolysis and implement appropriate therapy to combat this phenomenon.

Forensic Medicine, Paediatric and Perinatal Pathology

Symposium 1D

Challenging Cases - Do We Really Know?
Assoc. Prof. Dr Philip Beh
Associate Professor in Forensic Pathology, Department of Pathology, Li Ka Shing Faculty of Medicine, The University of Hong Kong

Forensic pathologists frequently find themselves in the national or international media over cases that they may have been involved in directly or indirectly. The casual observer would often feel that the pathologists involved should have foreseen that those cases are going to be challenging, but is that really true?

This paper will discuss the issues and factors that may make a case challenging. It is hope that the audience can reflect on them and perhaps be better prepared foe challenging cases in future.

Approach to Complicated Forensic Cases - Canada's Experience
Prof. Dr C. Milroy
Founder in Forensic Pathology, DMJ, Director, Eastern Ontario Forensic Pathology Unit, Full Professor University of Ottawa

Approach to Complicated Forensic Cases - Malaysia's Experience
Dato' Dr Zahari Noor
Head of Department and Consultant in Forensic Medicine, Hospital Pulau Pinang, Malaysia

Symposium 2D

Placental Infection and Stillbirth
Prof. Dr Tan Geok Chin
Professor of Pathology and Consultant Anatomical Pathology Department of Pathology, Faculty of Medicine, Universiti Kebangsaan Malaysia

Infection may result in stillbirth due to direct infection, injury to placental and severe maternal illness. Infection is more likely associated with early (20–28 weeks) compared with late stillbirths (after 28 weeks). Estimated 10 -25% of stillbirth may be a consequence of infection and this is higher in developing countries. Organisms that result in stillbirth include bacteria like Escherichia coli, group B streptococci, Ureaplasma urealyticum, Listeria monocytogenes and syphilis. Others are parasites like malaria and toxoplasma gondii, viruses like parvovirus, coxsackie virus and cytomegalovirus. Different types of infection produce specific histological changes to the infection, for examples, microabscesses at the subamniotic region of umbilical cord is a characteristic feature of candida infection, lymphoplasmacytic villitis is seen in syphilis and cytomegalovirus infection, and intervillous microabscesses in listeria infection. The complications of chorioamnionitis include hypoxic-ischaemic encephalopathy, cerebral palsy, periventricular leukomalacia, respiratory problems, intrauterine growth restriction, neonatal sepsis and stillbirth. Placental histological chorioamnionitis can be divided into the following stages: Acute subchorionitis (stage 1), acute chorioamnionitis (stage 2) and acute necrotising chorioamnionitis (stage 3). This is known as the maternal inflammatory response. In addition, there are specific histological features that indicate a fetal inflammatory response, namely chorionic vasculitis or umbilical phlebitis (stage 1), umbilical arteritis (stage 2) and necrotising funisitis (stage 3). Study showed that histological chorioamnionitis with fetal inflammatory response had a higher risk of spontaneous labour, while those without fetal inflammatory response had unexplained death. The latter was suggested that these fetuses were unable to mount a sufficient inflammatory response and were more likely to die in-utero.

Placental Causes of Stillbirth - Sharing Local Experience
Dr Nur Syahrina Rahim
Consultant Pathologist, Faculty of Medicine and Health Science, USIM

Placenta, often at time a neglected specimen by the pathologists and clinicians particularly in non-specialised centres.

Nevertheless, the evaluation of placenta is essential in stillbirth and is performed with or without perinatal autopsy. A thorough gross examination of the placenta can often identify a likely cause of stillbirth. Still, several factors may hamper the clinicopathological assessment, leading to limited interpretation and frustration amongst pathologists.

Notably, the placenta is not an uncommon organ to be encountered in forensic practice. In unusual fateful circumstances, the stillbirth befalls together with maternal death. Hence, placenta examination not just possibly explained the stillbirth, but may offers insight into maternal events.

The shared cases illustrate the value and relevant issues of placenta examination of stillbirths in varied clinical settings.

Forensic Significance of Intrauterine Death

Dr Khairul Anuar Zainun
Forensic Pathologist and Head of Forensic Medicine Department, Hospital Serdang, Selangor

Intrauterine death, when it occurs, is a real tragedy. It warrants proper investigation. More often than not, when intrauterine death investigation relates to existing laws of the country, the process may pose its own challenges. It requires detailed awareness of death circumstances, understanding of pregnancy physiology and knowledge of fetal developmental including placenta. Autopsy approach and procedures can be different from that commonly performed in death involving infants and children.

This presentation highlights the significance of intrauterine death from forensic pathologist perspectives in Malaysia. It will discuss relevant laws pertaining to intrauterine death, livebirth in abandoned fetus, timing of death in relation to delivery and role of trauma in the causation of death. It is essential to have all the information required prior to autopsy examination including access to relevant obstetric notes when intrauterine deaths occur in hospital settings. This is to ensure interpretations and opinions are rendered by the pathologists correctly.

Symposium 3D

Role of 2nd Autopsy - Malaysia's experience
Dr Siew Sheue Feng
Consultant in Forensic Medicine, Department of Forensic Medicine, Kuala Lumpur Hospital, Malaysia

An autopsy is a procedure that involves an examination of a dead body. It is destructive in nature and known to produce artefacts. Most forensic medicine experts will agree that a comprehensive, good quality autopsy will provide the most valuable information to the investigation of death. A second autopsy is not a prioritized choice and shall be avoided.

Most of the second autopsies involve disputed deaths occurred in lockups and detaining centres, whereas some were associated with actions of enforcement agencies. A distrust to the original post-mortem is perhaps the main factor calling for a second autopsy, especially when the original findings went against the wishes of a certain party. The role of a second autopsy in such cases is highly questionable.

An incomplete autopsy, which fails to address the issues surrounding a death is another common factor for a second autopsy. Many medical officers, forensic medicine specialists have been taught and believe that a full autopsy is not required once the cause of death has been identified and determined. They are unaware of the legal standard of proof in criminal cases and the meaning of “cause of death” as according to the laws of Malaysia. A second autopsy may also be beneficial in certain cases conducted by inexperienced medical officers.

In conclusion, a second autopsy is no better than the first autopsy, if the latter is properly conducted. A re-interpretation of the first autopsy findings together with new evidence evolved should be considered before proceeding for a second autopsy.

Role of 2nd Autopsy - India's experience
Prof. Dr OP Murty
Professor of Forensic Medicine and Toxicology, All India institute of Medical Sciences, New Delhi

Reviewing Autopsy/ Autopsy Reports in Hong Kong
Assoc. Prof. Dr Philip Beh
Associate Professor in Forensic Pathology, Department of Pathology, Li Ka Shing Faculty of Medicine, The University of Hong Kong

Hong Kong, despite the handover back to China in 1997 still practices death investigation under legislation largely similar to the UK’s Coroners System. Similar to many jurisdiction in the world, the number of autopsies performed are declining not just for hospital autopsies but also for Coroner’s autopsies. Despite this decline over 3,000 autopsies are still performed annually.

Worldwide, autopsy systems are promoting peer reviews of autopsies and autopsy reports. This is however not formalized in Hong Kong. Such reviews an take many forms and the value of such reviews will be illustrated in this talk.

Symposium 4D

Forensic anthropology: Challenges and the way forward
Dr Mohamad Azaini Ibrahim
Consultant Forensic Pathologist and Anthropologist, Department of Forensic Medicine, Kuala Lumpur Hospital, Malaysia

Forensic anthropology is the application of the knowledge of physical anthropology to solve medicolegal issues. The forensic anthropologist assists the police in locating and exhuming skeletal remains and performing an anthropological analysis on the remains to determine the biological profile i.e sex, age-at-death, ancestry and stature of the deceased. Presently forensic anthropologists are also involved in the identification of victims of mass disasters and genocide and are an integral part of any Disaster Victim Identification (DVI) team. Although well established in many developed countries this discipline is still in its infancy in Malaysia. This presentation will discuss the current practise of forensic anthropology in Malaysia and its place within the general inquiry into death as a provision under the Criminal Procedure Code. This presentation will also cite some well profiled local cases over the past 10 years where forensic anthropology played a major role in the investigation. The Malaysia DVI team was also involved in the identification of the victims of the MH17 air tragedy in 2014 and the victims in multiple clandestine graves along the Malaysia-Thailand border in 2015. This paper will also identify some of the challenges faced by the forensic anthropologist which has resulted in the slow acknowledgement of this discipline in an investigation into death – they are practical reasons as well as religious and sociocultural constraints unique to this country. Finally, this paper will propose steps to address these challenges with the hope that forensic anthropology in Malaysia will garner as much interest and be as developed as in other countries.

Result of toxicology analysis - Interpret it wisely
Dr Khairul Adli bin Nikman
Forensic Science Officer in Forensic Medicine Laboratory,Department of Forensic Medicine, Hospital Sungai Buloh

A number of factors could influence the interpretation of toxicology analytical results, especially when post-mortem samples are concerned. Possible factors may be associated with: 1) the nature of the drug/poison detected, 2) the method of sampling, transport and storage, 3) the method of analysis applied, 4) the circumstances of exposure to contaminant, and 5) the circumstances that are related to death (if the medical and drug use history of the deceased person is made available) and postmortem changes. In certain situations, the interpretation of analytical measurement can be simplified by regulation. Terms such as 'therapeutic', 'normal', 'normally expected' or 'target ranges' have been conventionally used when analyzing the concentrations of many drugs and their metabolites presented in whole blood, plasma or serum. The interpretation of the toxicological results can sometimes be straightforward, but most of the time is difficult. It depends on the understanding of the principles of the analysis, the specimens used and their suitability for the analysis, the stability of the substances detected, and other relevant factors that could influence the results. The result of analysis can offer an objective

evidence of the exposure of the drugs/poisons. However, the interpretation made in the knowledge of the possible effects of the detected drugs/poisons might influence the outcome of the investigation.

Forensic DNA Analysis - Challenges and the Way Forward

Pn Nor Aidora Saedon
Director of Forensic DNA Division, Department of Chemistry, Malaysia

Forensic DNA analysis in Malaysia had gone through a marvelous advancement since it was first launched in 1995. It used to be the RFLP techniques using radioactive isotopes to the HLA DQα and straight to PCR-STR technique. The process of hands on extraction via organic or Chelex, has evolved to automated platform via Solid Phase Extraction (SPE) methods. Since the extraction step has been shortened, the technology is no longer about the ability to extract but the quality of the extracted DNA. The quantitation process is coupled with extraction to ensure sufficient amounts of extracted DNA as well as the ability to detect male DNA and the rate of degradation. The amplification process in a single multiplex has increased from 9 to 24 loci for individual identification. Last but not least, interpretation of DNA profiles especially mixtures is another laborious task for Forensic DNA scientists worldwide.

Although it has progressed tremendously, there are still numerous challenges directly impacted on the quality of the samples submitted which leads to inability to generate interpretable DNA profiles, such as climate, storage conditions and sampling procedures. We may have the latest innovative technology in Forensic DNA analysis but it is futile when these destructive challenges are not dealt with accordingly. The understanding of basic fundamentals of Forensic DNA samples and the cooperation of inter-agencies are required to overcome some of these challenges.

Symposium 5D

Technology - Destructive or Supportive Evidence In Court
Prof. Dr C. Milroy
Founder in Forensic Pathology, DMJ, Director, Eastern Ontario Forensic Pathology Unit, Full Professor University of Ottawa

Histology - Supportive or Detrimental Evidence in Court
Dr Mohd Suhani Mohd Noor
Consultant Forensic Pathologist, Department of Forensic Medicine, Sultanah Bahiyah Hospital, Alor Setar, Malaysia

Forensic histopathology is the application of histological techniques and examination in forensic pathology practice, and like any other findings garnered during an autopsy, postmortem histological findings form part of the autopsy evidence presented in court. Because the applied histological techniques are similar to clinical histopathology, it is not unusual for some forensic pathologists who lack training in histopathology to defer entirely to the anatomical pathologists for their histological examination; a flawed practice, not least because anatomical pathologists are usually unfamiliar with histothanatology. It is crucial that the forensic pathologists themselves must be competent and comfortable in conducting a forensic histopathology examination and be aware of the limits of what histology can offer to a forensic pathology investigation. Although the scope and practice of autopsy tissue sampling for histology varies between centers, postmortem histology has proven to be an invaluable primary ancillary tool in the investigation of sudden natural deaths, dating of lesions and injuries, and in the detection of sequelae in delayed unnatural deaths. As histology provides permanent documentation of the pathologies identified at autopsy, it is also a valuable tool for auditing a forensic pathology service and can be made available for reexamination by other experts in subsequent case reviews. This presentation will illustrate by case examples how histology can be indispensable evidence in court and how, either through erroneous reporting or overinterpretation, it can prove to be detrimental to justice.

Forensic Imaging - Destructive or Supportive Evidence in Court
Assoc. Prof. Datin Dr Mansharan Kaur A/P Chainchal Singh
Associate Professor in Radiology, Faculty of Medicine, Universiti Teknologi MARA

Advances in technology have led to the use of various digital techniques including the use of radiological imaging in the presentation of evidence to the courts. In some cases, these techniques have allowed the court to gain more valuable information than would otherwise have been evident. In other cases, it has allowed the court to receive evidence that it would not have been able to receive without the assistance of digital technology. Radiological imaging which includes the use of x rays, post mortem computed tomography (PMCT and PMCTA) as well as Magnetic Resonance Imaging (MRI) enables a complete and permanent recording in real time of the images it produces and these images can readily be transmitted. Further, the process occurs

before the body is subject to surgical intervention which may reveal important factors demonstrating the cause of death that can be missed in autopsies.

Medical Microbiology, Parasitology and Immunology

Symposium 1E

Mass Spectrophotometry Application in Infectious Diseases
Dr. Kartina Mohd Nor
Department of Pathology, Hospital Sultan Abdul Halim, Sungai Petani, Kedah, Malaysia

Mass spectrophotometry has been used for many decades but only in the 1970s, it was proposed for bacterial characterization. As a result, matrix-assisted laser desorption ionization time of flight mass spectrometry (MALDI-TOF MS) was developed. It is a rapid, accurate, cost effective method in microbial characterization and identification. It is used to identify bacteria and fungi in laboratory settings in main public hospitals in Malaysia. The experiences, advantages as well as disadvantages and important practical issues will be presented.

Current Trends in Microbiological Diagnostics and Clinical Application of Rapid Diagnostic Tests in Infectious Disease
Prof. Dr. Alex van Belkum
bioMérieux, Open Innovation & Partnerships, La Balme Les Grottes, France

Rapidity is one of the most important parameters and central pillars of modern diagnostics in infectious diseases management. Next to speed, also costs, availability, technical complexity and quite a few other parameters are important parameters when making local choices for in vitro tests. Classical culture-based technologies have continued to suffer from lack of speed, although modulation of media has resulted in improvements over the years. Still, in order to improve on the overall speed of testing, lengthy procedures should be circumvented and there is an obvious need for more direct methods. Serology has proven to be one of those candidate technologies and with the advent of miniaturized testing formats both the rapidity and efficacy of immunological testing has been improved. Better, molecular diagnostics has now facilitated the reliable and (semi-)quantitative detection of essentially all pathogens that carry nucleic acids. Single tests have been developed for all clinically relevant pathogens, but currently multiplexed tests that target specific syndromes (respiratory infections, sexually transmitted infections, gastrointestinal infections etc) are rapidly gaining in usefulness and popularity. New trends in IVD are laboratory automation, consolidation of labs and the development of dedicated satellite laboratories, inclusion of omics technologies (mostly next generation sequencing) and, last but not least, optimized data management using artificial intelligence and machine learning components. All technological and data management development will work in concert for further improvement in the adequate application of IVD in clinical microbiology and infectious diseases.

Next to the mostly laboratory-oriented developments sketched above, improved diagnostics will have an impact on the medical sector. The use of tests will result in better diagnosis, surveillance application of tests will result in better assessment in infectious epidemiology and, most importantly, antimicrobial resistance testing will result in better, more targeted use of therapeutic antibiotics. The impact of the newer diagnostic tests will be discussed in the context of increasing numbers of infectious disease outbreaks (antimicrobial resistance spread, coronavirus outbreaks, the annual

influenza waves etc) and the better protection of increasing numbers of susceptible individuals (elderly, immune-compromised, transplant patients etc).

This one hour-presentation will be split in two sections as based on the two-component title. The first part will be on test quality, the second on test application in specific infectious diseases. The references below provide current state-of-the art information on several of the topics covered above.

Symposium 2E

Genetic Approaches in Diagnosing Patients with Primary Immunodeficiency Diseases
Dr. Siti Mardhiana Mohamad
Immunology Unit, Advanced Diagnostic Laboratory, Advanced Medical and Dental Institute, Universiti Sains Malaysia

Primary Immunodeficiency Diseases (PIDs) are a heterogeneous group of genetic disorders characterised by malfunctioning of the immune system that predisposes to different patterns of infections, allergy, autoimmunity and cancer. To date, more than 400 gene defects have been identified to cause PIDs. PIDs are considered to be 'experiments of nature' as they provide in vivo assessment of the functional consequences when specific genes are defective and help our understanding of the basic cellular pathways and mechanisms of host defence in the human immune system.

There have been several approaches that have been used to identify the genetic defects that cause the diseases in PIDs patients. The three major approaches that are currently favoured are: 1) targeted sequencing - investigating candidate genes within pathways that are known to be important and shown to be dysfunctional, 2) genomic approaches such as next generation sequencing (NGS) and/or linkage analysis and 3) comparative genetics, i.e. similarity of the clinical phenotypes to mouse models.

The identification of a genetic defect provides a huge impact for the patients and family members. Importantly, it helps to provide precise diagnosis and accurate prognosis for the patient. Since patients with PIDs are associated with increased morbidity and mortality, the molecular diagnostics enable the appropriate therapy and treatment to be given to the patients so that a permanent curative can be given and lifesaving for the patients.

Updates in Allergic Testing
Dr. Amir Hamzah Abdul Latiff
Allergy & Immunology Centre, Pantai Hospital Kuala Lumpur

Allergic diseases pose huge economic burden and adverse effects on quality of life. Serum specific IgE has been considered a surrogate allergy marker for decades. An overview on current status of allergy testing is discussed in this presentation, including molecular testing. Other modalities of allergy testing include skin prick tests which are useful for aero-allergies whereas oral challenge tests are best for identifying suspected food allergies. An allergy test should be individualised based on clinical features, diagnostic efficacy, and cost-benefit analysis.

Anti-nuclear Antibody Test - An Update
Assoc. Prof. Dr. Asrul Abdul Wahab
Department of Medical Microbiology and Immunology, Faculty of Medicine, Universiti Kebangsaan Malaysia

Anti-nuclear antibody (ANA) test is a common laboratory test requested particularly for the working diagnosis of systemic autoimmune rheumatic diseases. There are many laboratory methods available for the detection of ANA, but indirect immunofluorescence (IIF) has been considered as the gold standard. Usually for ANA-IIF positive reporting, it requires the report of the pattern and titration. However, the significant ANA-IIF positive titration is different between the laboratories and similarly the report of the pattern may differ from one individual to another. To add to these challenges, the recognition of the new pattern such as dense-fine speckled requires further evaluation to determine their clinical significance. Recently, the introduction of the International Consensus on ANA Patterns (ICAP) helps to provide the platform towards education and standardization of ANA reporting. Furthermore, the encouraging performance of the digital imaging software in interpreting ANA pattern will further reduce the gap towards the standardization of ANA-IIF testing and reporting.

Symposium 3E

What We Should Know About SARS Coronavirus 2

Prof. Dr. Zamberi Sekawi
Department of Medical Microbiology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

On March 11th, 2020, WHO has declared SARS-CoV-2 pandemic which has to date globally infected 73 million and killed 1.6 million people. It has affected virtually all countries including Malaysia. Various methods were employed by all countries to control the pandemic which include lockdowns, quarantine and complying with standard operating procedures such as social distancing, wearing masks and good hand hygiene. The pandemic has also a severe impact on global economy and has increased poverty rates and therefore pose serious threats to human health in a big way.

The virus which originates from animals and bats were implicated as the natural reservoir. However, intermediate hosts was never confirmed to link to the current pandemic. Coronaviruses generally mutate at a slower pace compared to other viruses. This may be a good thing but a minor mutation on D614G was postulated to increase its efficiency in transmission. However, this mutation has not shown to increase its virulence.

Initially thought to be only limited to the respiratory tract, it is now shown that the virus had gone to infect other organs and even creating havoc to the immune system and thus many patients died because of the overwhelmed immune overreaction. Long term immunity has been debatable and cannot be proven at the moment. The reduction in antibodies in recovered patients may indicate loss in immunity but one must not rule out the role of T cells in preventing future infections. Studies on T cells are ongoing and preliminary, there is a promising role of T cells in coronavirus infections.

Diagnostic Challenges of Hepatitis B Escape Mutant

Assoc. Prof. Dr. Zetti Zainol Rashid
Department of Medical Microbiology & Immunology, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

Hepatitis B (HBV) viral infection causes acute and chronic liver disease, preventable by vaccination. One third of the world population have serological evidence HBV infection. In 2015 an estimated 257 million people were living with chronic HBV infection. Worldwide it is a primary cause of cirrhosis and hepatocellular carcinoma. Hepatitis B belongs to the Hepadnaviridae family, the smallest DNA-enveloped virus, with a unique genome and replication mechanism. The genome has four overlapping open reading frames (ORFs): preS/S, precore/core, pol and X ORF. High mutation rate results in genetic variability or production of viral variants, known as “quasi-species”. Viral selection depends on factors such as viral fitness, host immune response and external factors ie vaccination and antiviral therapy. Laboratory diagnosis is based on the detection of HBsAg, the antigen that induces protective antibody (anti-HBs). In most cases, serological markers including anti-HBcore and anti-HBs, can identify different clinical stages of

viral persistence; chronic hepatitis B, “healthy carrier” or occult hepatitis B infection. Mutations within HBsAg alter the antigenicity of HBsAg, which give rise to s-gene mutants or “escape mutants”. These mutants escape neutralising anti-HBs antibodies including vaccine-induced immunity, affect the success of vaccinations using HBsAg, escape from anti-HBV immunoglobulin therapy, and affect detection by diagnostic immunoassays. Escape mutants form a subset of occult hepatitis B infection (OBI), which are HBsAg-negative with detectable HBV DNA in liver and/or blood, by a sensitive molecular method. Mutations were also detected among immunosuppressed patients who developed HBV reactivation, who previously had anti-HBs. Pol gene mutations have also been described, causing resistance to nucleos(t)ide analogues antiviral therapy. Precore/core mutants cause HBeAg-negative chronic hepatitis B with presence of anti-HBe, where viral replication continues, and HBV DNA is detectable. X-gene mutations may alter the function of the nonstructural X protein, with possible role in HBV replication and carcinogenesis.

Molecular Diagnostics for Viral Meningitis and Encephalitis

Prof. Dr. Jamal I-Ching Sam
Department of Medical Microbiology, University Malaya, Kuala Lumpur, Malaysia

Viral meningitis and encephalitis have traditionally depended on serology and culture for diagnosis of causative agents. These methods are insensitive and slow and have been largely superseded by molecular methods. This talk will cover available molecular diagnostic assays and their advantages and disadvantages, as well as clinical impact.

Symposium 4E

Update on Parasitic Infections: Conventional and Advanced Diagnostic Approaches
Prof. Dr Rukman Awang Hamat
Department of Medical Microbiology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

Parasitic infections continue to be one of the most devastating diseases affecting humans worldwide. Appropriate anti-parasitic agents and sustainable preventive measures are the main key implementation for successful reduction of mortality and morbidity of parasitic diseases. However, these are largely dependent on the timely and accurate detection of the parasitic agents. For many decades, the diagnosis of parasitic infections relies on the microscopic examination which is very labour-intensive and time-consuming. Nonetheless, in situations where clinical samples or affected tissues are not readily available, non-microscopic methods such as immunological and molecular approaches can be considered. In addition, as misdiagnosis of several parasitic diseases would significantly influence the impact on the optimum care of the patient, several advanced methods of diagnosis have been developed and have gained much attention by the parasitologist.

Molecular Diagnosis of Malaria: What's New?
Dr Zulkarnain Md Idris
Department of Parasitology and Medical Entomology, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

Malaria is a mosquito-borne disease caused by five species of Plasmodium parasites. People infected with malaria often experience fever, chills and flu-like illness. Left untreated, they may develop severe complications and die. Prompt and accurate diagnosis of malaria play an essential part in malaria treatment, control and elimination. While the sensitivities of conventional diagnostic methods i.e. light microscopy (LM) is generally sufficient to diagnose acute malaria cases, it has important limitations in low-endemic settings, as substantial proportion of infections might be asymptomatic and sub-patent. By increasing sensitivity of malaria parasites detection compared to LM, molecular techniques provide a more sensitive approach to diagnose very low parasite density infections. Molecular techniques, such as polymerase chain reaction (PCR) enables the specific identification of malarial parasites up to the species level. With conventional diagnostic methods falling short in terms of practicality or having incomplete coverage of all medically important Plasmodia, PCR-based methods seem promising as the new gold standard in malaria diagnosis, especially in the cases with low parasitaemia or in the case of mixed species. In this talk, I will discuss a comprehensive overview of the currently available molecular malaria diagnostics, ranging from well-known tests to practical issue for the application of molecular tests in malaria identification. Indirect reference range establishment

Symposium 5E

The role of non-cultural technique in yeast infection
Assoc. Prof. Dr. Azian Harun
Department of Microbiology and Parasitology, School of Medical Sciences, Health Campus, Universiti Sains Malaysia

Fungal infections caused by various yeast pathogens have been reported to be increasing worldwide. The emergence of antifungal resistance among yeast warrants accurate, reliable laboratory diagnosis to ensure prompt, targeted treatment. As culture technique is time-consuming and has low sensitivity, there is a crucial role for alternative, non-culture diagnostic methods. A number of methods including multiplex-PCR analyses, T2 magnetic resonance and fungus-specific DNA microarrays are reviewed, with regard to their principles, advantages and current applications.

Current Microbiological Techniques for the Diagnosis of Nontuberculous Mycobacterial Infections
Assoc. Prof. Dr. Nadia Atiya
Department of Medical Microbiology, University Malaya, Kuala Lumpur, Malaysia

The majority of nontuberculous mycobacteria (NTM) isolated in diagnostic microbiology laboratories are respiratory isolates. Although the isolation of NTM from respiratory sites usually reflects environmental contamination/colonisation, their growth in culture may also represent a clinically significant lung infection. Due to factors such as cost as well as lack of appropriate laboratory facilities, technical skills and expertise, diagnostic methods/tools for the identification of NTMs may not be widely available, especially in resource-limited settings. Hence, the diagnosis of NTM infections remains a challenge in developing countries. In this presentation, I will give an overview of and updates on the different microbiological techniques currently available for the diagnosis of NTM infections, including line probe assay and gene sequencing, with emphasis on their advantages and limitations.

Sepsis Biomarkers
Assoc. Prof. Dr. Tan Toh Leong
Department of Emergency Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia

Sepsis is one of the major causes of death in Malaysia and globally. The results of the Global Burden of Disease Sepsis Study were published 17 January in The Lancet and presented at the Critical Care Reviews meeting in Belfast. It is the fact that twice as many people are dying from sepsis worldwide than previously estimated, with 48.9 million cases and 11 million deaths in 2017 alone. One in every 5 deaths worldwide are associated with sepsis. Two out of every 5 cases are in children under 5. About 85 % occur in low- or middle-income countries It is also the third principle cause of death in Malaysia in the year 2016, which is about 13.3% out of other causes of death. However, sepsis is the second-leading cause leading to intensive care unit (ICU) admission in the year 2016 in Malaysia. Given the morbidity and mortality associated with sepsis,

the ability to risk stratification in early phase of their illness may assist the physician to more effectively manage the care and to improve their outcome. Bacteraemia sepsis is a condition in which patients have systemic inflammatory response syndrome associated with infection. Early diagnosis of a bacterial infection is necessary because it can evolve rapidly, and treatment depends on antibiotic administration. Clinicians are in need of good diagnostic and prognostic biomarkers to identify infected patients who would benefit from prompt antibiotic therapy as early as possible, thus, improve the survival rate. Traditionally, the white blood cell (WBC) count, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) are utilised as common screening laboratory tests, but these have poor sensitivity and specificity. Therefore, there is a need to explore other biomarkers that are specific and sensitive in correlation to sepsis diagnosis, prognosis and differentiate bacterial infection.

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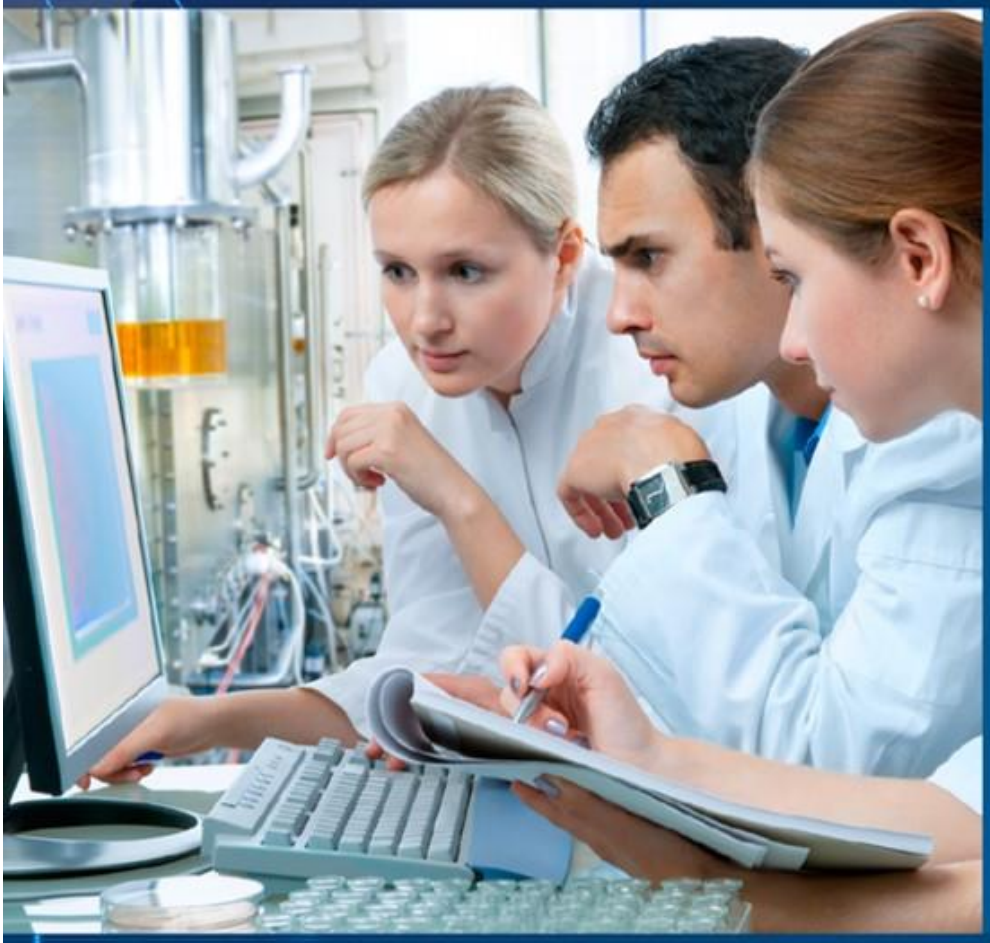

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