



CONNECTING THE DOTS

DEVELOPING AN INTERDISCIPLINARY RESEARCH ECOSYSTEM FOR ELDERLY CARE





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FROM THE VDR'S DESK THE NEXT STEPS FOR ELDERLY CARE

by Vice-Dean Research, Professor Lim Kah Leong



Vice-Dean Research, Professor Lim Kah Leong

Time flies. We have reached the end of the first quarter of 2022 and we are pleased to announce the third issue of STRIDES, where we celebrate the School's research achievements from all levels, be it our junior scientists including our PhD students or our faculty.

In this issue, we are building upon the foundations led by LKCMedicine Dean, Professor Joseph Sung in developing an interdisciplinary research ecosystem for elderly care using AI and Robotics.

Our collaborators from NTU Institute of Science and Technology for Humanity (NISTH) have contributed to this edition of STRIDES with a feature article titled "Connecting the Dots". This article showcases how various institutions within NTU as well as NHG has come together to synergise the strengths of various disciplines to integrate technology into the delivery of care for the elderly. For a start, ten projects that involve NTU and NHG collaborators were awarded for the MoE AcRF Tier 1 Thematic Call on Technology for the elderly, which was proposed by LKCMedicine. This is an excellent start to address elderly care as this allows us to consolidate our efforts with NTU and NHG to streamline research ideas and find new ways to improve the health and wealth being of our silver generation.

With the silver tsunami fast approaching day by day that exacts significant burden on the health and medical system, it is important for LKCMedicine to join forces with its counterparts in NTU and NHG to move the needle of translational research that can benefit the community.

Through such multidisciplinary collaborations that provides end-to-end coverage, we would then be able to offer a silver lining to the silver tsunami that we are confronted with.

Let's make the strides towards achieving this together!

CONNECTING THE DOTS DEVELOPING AN INTERDISCIPLINARY RESEARCH ECOSYSTEM FOR ELDERLY CARE

BY HEDREN SUM, NTU INSTITUTE OF SCIENCE AND TECHNOLOGY FOR HUMANITY (NISTH)

Population ageing continues to be a significant challenge for society. While the phenomenon is becoming a global experience affecting every nation globally, countries in the east and Southeast Asia are likely to face the fastest increase between 2019 and 2050, according to United Nations. The rapid ageing reflects a demographic reality in our era that is associated with an increase in the social commitment to delivering care to the older population with frailty and chronic conditions. On the other hand, we already see Southeast Asian countries rapidly embracing digitalisation, with the pandemic dramatically accelerating this shift further. In Singapore, initiatives like Smart Nation continues to drive its reputation as a technology hub and propel technological innovations forward.

Now the question lies in how can we responsibly design and develop technology-supported solutions to support an ageing community. To begin, Nanyang Technological University (NTU) has since recognised the need to address the challenge of healthy living and ageing by identifying Health and Society as one of the six research clusters in the NTU2025 strategy. An interdisciplinary approach is critical to developing socially and culturally appropriate technological solutions that improve the care for the elderly.

The AI-Robotics for Health and Well-being of Elderly (AI-R for Elderly) workshops, organised in partnerships with LKCMedicine, NTU Institute of Science and Technology for Humanity and NTU College of Engineering, have created an interdisciplinary ecosystem of NTU researchers and clinicians from the National Healthcare Group across healthcare, engineering, social sciences, humanities, business, and health sciences. We aspire to integrate social science approaches into science and engineering through the interaction of expertise to develop interdisciplinary methods that extend from planning through innovation, assessment, implementation and expansion. Relevant research on integrating technology into elderly care was explored in four domains: Frailty, Cognition, Mental Well-being, and Connectivity.



3rd AI-R for Elderly workshop on 4 March 2022

CONNECTING THE DOTS DEVELOPING AN INTERDISCIPLINARY RESEARCH

ECOSYSTEM FOR ELDERLY CARE

AWARDED PROJECTS FROM MOE ACRF TIER 1 THEMATIC CALL ON TECHNOLOGY FOR ELDERLY

DEMENTIA

Novel MRI Toolbox to Classify and Predict Asian Mild Cognitive Impairment Nagaendran Kandiah (LKCMedicine)

Early detection of mild cognitive impairment (MCI) through a novel digital assessment Guan Cuntai (SCSE)

Novel methods of network modelling and personalised machine learning to understand and predict individual dementia using heterogeneous multi-omics data

Wilson Goh (LKCMedicine)

A Two-Phase Al Approach for Early Detection of Dementia Sharon Ng (NBS)

funding and the next phase of growth.

sensitivity towards the needs of the elderly.

CONNECTIVITY

Intergenerational Digital Media Socialisation for Enhancing Elderly Digital & Health Literacy May Lwin (WKWSCI)

Assessing the Quality of Telemedicine: A Social Interactional Investigation of Tele-Advance Care Planning Consultations in Singapore KK Luke (SSS)

ImprovingIntergenerationalCommunicationandBondingthrough Applying Video-mediatedCommunicationandSimultaneous GameplayRingo Ho (ARISE)

Digital Connectivity for Cancer Screening in Elderly Using Artificial Intelligence and Mobile Apps Jack Tong (NBS)

An MoE AcRF Tier 1 Thematic Call on Technology for Elderly was launched late last year and awarded ten projects across dementia, connectivity and mental wellness. The third instalment of the AI-R for Elderly workshop was held on 4 March 2022. More than 30 principal investigators of the awarded research who are experts from various disciplines gathered to explore synergies among the studies and ideas to converge them towards future priorities,

The discussions of the AI-R for Elderly workshops have recognised the strengths of various disciplines to integrate technology in the delivery of elderly care. However, it also surfaces the complexities and the need to identify problems, formulate research and assess the outcomes from an elderly-centred perspective. Hence, fostering interdisciplinarity becomes integral to developing meaningful innovations with appropriate appreciation and

MENTAL WELLNESS

Mobile-based digital mental health tools for older adults: the needs, current solutions, and recommendations for future Lorraine Car (LKCMedicine)

LeveragingSocialMediaInfluencersandArtificialIntelligenceforPsychosocialwellbeingInterventionsamongthe ElderlyChen Lou (WKWSCI)

INAUGURAL JAMES BEST DISTINGUISHED LECTURE



Marking another milestone in the School, LKCMedicine launched its first ever named lecture, the James Best Distinguished Lecture on 19 March 2022. The lecture series is supported by the LKCMedicine 10th Anniversary (2020) Distinguished Visitor Programme, funded by a \$500,000 gift by an anonymous donor. With a matching grant by the Singapore government, the total gift is S\$1 million. Professor James Best, LKCMedicine former Dean and Visiting Professor, was the first speaker of the series. He delivered his lecture titled "Preserving the art and furthering the science of medicine" where he highlighted the role of medical schools as agents of influence for the future of medicine. The next speaker in this series is Nobel Laureate Professor Barry Marshall.

LKCMEDICINE OPEN LECTURE





With the easing of COVID-19 measures, LKCMedicine held a hybrid Open Lecture featuring Visiting Associate Professor Kelvin Tsoi at the HQ Lecture Theatre on 23 March 2022. Attended by about 100 attendees both online and onsite, A/Prof Tsoi gave a talk titled "How can we land from the Cloud? A Story from Big Data to Digital Health" where he presented on his experience of learning the interdisciplinary language from medicine to engineering, and also from Big Data to Digital Health. He also shared his entrepreneurship experience in engaging participation from the community for better health management. The lecture concluded with a lively Q&A session.

NTU SCIENTISTS CREATE PROGRAM THAT CAN DETECT HIGHER RISK OF DEPRESSION



Scientists from NTU have developed a computer programme that can detect individuals who are at a higher risk of developing depression. The predictive programmme analyses a person's physical activity, sleep patterns and circadian rhythms through data obtained from wearable devices such as Fitbit watches. A trial of 290 adults carried out in 2019 over three months showed that the programme has an accuracy of 80 per cent in detecting those with depression, or who are at a high risk of developing depressive symptoms/depression, as compared with healthy individuals. Professor Josip Car, Director, Centre for Population Health Sciences at LKCMedicine, who co-led the study, said that to fine-tune and improve the machine-learning algorithm, the team is planning larger studies of more than 1,000 participants monitored over a course of two years.

LKCMEDICINE RESEARCH ASSISTANT WINS ASIAN SCIENTIST LAB TECH OF THE YEAR



LKCMedicine continues to make waves in research achievements. Ms Karen Chung, LKCMedicine research assistant from Professor George Augustine's Lab, won the Ace Award at the Asian Scientist Lab Tech of the Year 2021. The national competition is organised by Asian Scientist Magazine and honours laboratory technicians who are making waves in Singapore's research and innovation ecosystem. Karen is among 15 lab technicians who received the awards from Mr Alvin Tan, Minister of State for Culture, Community and Youth & Trade and Industry at a ceremony held on 18 March 2022.

IN PARTNERSHIP WITH NATIONAL HEALTHCARE GROUP

Faculty from LKCMedicine and NHG jointly organised the Mental Symposium on 29 March 2022. LKCMedicine Vice-Dean (Research) Professor Lim Kah Leong kickedoff the symposium with an opening address, followed by a series of presentations by faculty members from both isnsitutions. The symposium moderators - LKCMedicine Professor George Augustine and NHG Associate Mythily Subramaniam, together with Professor LKCMedicine Assistant Professor Lorraine Tudor Car, conducted a panel discussion that generated energetic discussions and highlighted complementary areas for inter-institutional works. NHG's Clinical Director of Clinician Scientist Development Office, Group Research, Associate Professor Lim Su Chi brought the symposium to a close by reiterating the importance of working together to tackle the complexities of mental health.











IN PARTNERSHIP WITH IMPERIAL COLLEGE LONDON

LKCMedicine and Imperial College London jointly held the 4th Joint Neuroscience Workshop on Mental Health on 22 Feb 2022 that was well attended by faculty members from both institutions. Professors George Augustine and Paul Matthews started the workshop with a warm welcome to the more than 60 participants who attended via Zoom. Besides presentations by LKCMedicine faculty, the workshop also featured short talks from early career researchers. There was great enthusiasm from both Schools for future collaborations, with both LKCMedicine and Imperial highlighting available opportunities for travel and exchanges for researchers and faculty.







FIRST CHA-NTU COLLABORATIVE SYMPOSIUM ON STEM CELLS AND REGENERATIVE MEDICINE



NTU Singapore, and by extension LKCMedicine, place high importance on international collaborations. The first Collaborative Symposium on Stem Cells and Regenerative Medicine with CHA University Korea held on 31 March 2022 did just that. The first half of the symposium featured presentations by CHA University's faculty which began with a welcome address and CHA research overview by Professor Ho Sup Yoon who is the President of CHA Advanced Research Institute, Korea. The second half featured presentations by LKCMedicine faculty following a welcome address and overview on LKCMedicine's research by Vice-Dean (Research) Professor Lim Kah Leong. The symposium concluded with remarks by Prof Ho and Prof Lim who both reiterated the importance of collaborative research. Future meetings with CHA and NTU are in the pipeline.

LKCMEDICINE AND UNIVERSITY OF BRITISH COLUMBIA JOINT SYMPOSIUM ON PRECISION ONCOLOGY





LKCMedicine continues to forge global partnerships through a joint symposium with University of British Columbia (UBC) held on 24 March 2022. LKCMedicine Dean Professor Joseph Sung and Dr Rob McMaster, Vice-Dean, Research, Faculty of Medicine, UBC, gave a warm welcome to the speakers and participants through their opening remarks, followed by presentations by LKCMedicine and UBC faculty. The panel discussion was chaired by LKCMedicine Vice-Dean (Research) Professor Lim Kah Leong and Dr McMaster. It was a lively Q&A session with ideas raised for future collaborations on precision oncology. The symposium concluded with closing remarks by Prof Lim and Dr McMaster who reiterated the importance of research collaborations in this area and also in other fields such as microbiome, and separately, the ageing brain. More research symposiums between both schools are on the horizon.

GRANT AWARDS CONGRATULATIONS TO ALL!

MOE TIER 2

Yusuf Ali Islet macrophages control inflammation and B-cell dysfunction during diabetes

NHIC INNOVATION TO DEVELOP "I2D" GRANT

Maurice Van Steensel Development of anti-acne smart bomb – a novel targeted treatment

Singapore Therapeutics Development Review (STDR)

Kevin Pethe

Repurposing bactericidal drug combinations for non-tuberculous mycobacterial diseases

Franklin Zhong

Developing topical small molecule inhibitors of ZAKalpha kinase to treat inflammatory skin diseases

Imperial NTU Collaboration Fund 21/22

Marie Loh

Role of DNA methylation in human obesity and diabetes

Suresh Jesuthasan

Imaging neuromodulation during behaviour: how the brain regulates its circuitry

Jennifer Cleland

Outward visit to the Medical Education Research and Scholarship Unit

13

EdeX Teaching and Learning Grant

Joanne Ngeow

Integrating Next-Generation Sequencing Into UnderGraduate Health Training (INSIGHT)

Han Siew Ping

Transformational effects of curriculum co-creation in medical education

Vivek Perumal

Utility of low-fidelity 3D anatomy models in improving visuospatial understanding among spatially challenged students

RESEARCH PUBLICATIONS





ASSOCIATE PROFESSOR SUNNY WONG

STRESS HYPERGLYCEMIA IS ASSOCIATED WITH AN INCREASED RISK OF SUBSEQUENT DEVELOPMENT OF DIABETES AMONG BACTEREMIC AND NONBACTEREMIC PATIENTS DIABETES CARE

Stress hyperglycemia is associated with an increased risk of diabetes among survivors of critical illness. We investigated whether patients without diabetes hospitalised for bacteremia or nonbacteremic diseases with transient stress hyperglycemia would have a higher risk of subsequent diabetes development compared with those who remained normoglycemic. In conclusion, hospitalised patients with transient stress hyperglycemia had a higher risk of subsequent diabetes development compared risk of subsequent diabetes development compared with their normoglycemic counterparts. Recognition of an increased risk of diabetes in these patients can allow early detection and monitoring in their subsequent follow-ups.



ASSOCIATE PROFESSOR YUSUF ALI

DESTABILIZATION OF B CELL FIT2 BY SATURATED FATTY ACIDS ALTER LIPID DROPLET NUMBERS AND CONTRIBUTE TO ER STRESS AND DIABETES

PNAS

Western-type diets are linked to obesity and diabetes due to their high-saturated fatty acid content. B cell vulnerability to free fatty acids reduces insulin provision and leads to diabetes. The novel study led by Associate Professor Yusuf Ali revealed the mechanisms on how saturated fatty acids reduce fat storage – inducing transmembrane protein, which in turn induces B cell dysfunction and death, leading to diabetes. The findings of this study provide considerable therapeutic value for preventing B cell dysfunction and loss.

RESEARCH PUBLICATIONS





PROFESSOR JOHN CHAMBERS

GENETIC VARIATION INFLUENCING DNA METHYLATION PROVIDES INSIGHTS INTO MOLECULAR MECHANISMS REGULATING GENOMIC FUNCTION

NATURE GENETICS

Improved understanding of the mechanisms influencing DNA methylation is anticipated to provide new insights into the biological pathways that determine genome regulation, molecular phenotypes and development of disease. In a study led by Professor John Chambers, the research team made insightful findings on the biological pathways underpinning phenotypic variation. The findings will serve to inform hypothesis-driven experimental studies to define the specific molecular mechanisms involved.

WOMEN IN SCIENCE @LKCMEDICINE



2022 NTU WIEST DEVELOPMENT GRANT WINNERS

Women@NTU and Promotion of Women in Engineering, Research and Science (POWERS) announced 18 winners of the Women in Engineering, Science, and Technology (WiEST) Development Grant 2022. Winners coming from College of Engineering, College of Science, Micron Technology and Lee Kong Chian School of Medicine were presented their awards on 7 April 2022 at POWERS Panel Discussions, which was graced by Dr Tan See Leng, Minister for Manpower and Second Minister for Trade and Industry. LKCMedicine has two winners: Dr Zeng Jia Liu (Presidential Postdoctoral Fellow) and Miss Lai Kei Onn (PhD student). – Our heartfelt congratulations to Jia Liu and Kei Onn!

The WiEST Development Grant was established in 2018, to promote networking and support development opportunities for junior female engineers, scientists, and technologists. The \$3,000 one-off grant will cover costs for conferences (including registration and travel expenditures), as well as virtual symposia and trainings that would enhance professional growth. If you are a female researcher approaching your fourth year of PhD or in your early career (within two years of the award of PhD degree), do stay tune for the next grant application cycle and submit your application!



BREAKING NEW GROUND - WOMEN IN SCIENCE @ LKCMEDICINE PODCAST SERIES

With help from LKCMedicine Communications and Outreach, the new Podcast series "Breaking New Ground – By women, on women, for all" features the successes, challenges and solutions, as well as aspirations of woman scientists. Woman scientists from all walks share stories of their scientific journeys, goals and vision of their careers, and give valuable advice to fellow scientists and researchers. The first two episodes are already out – Don't miss them!

Episode 1: <u>Professor Christine Mummery on "Disease modelling using pluripotent stem cells"</u> Episode 2: <u>Sharing by LKCMedicine Early Researcher Network (LEARN) award winners: Dr Bilge Ercan and Dr Dorrain Low</u>

LEARN HAPPENINGS









On 14 and 15 February 2022, LEARN (LKCMedicine's Postdoc Club) and LKCMedicineGSC (Ggraduate Students' Club) jointly organised the New Frontiers in Biomedicine – 2022 conference. This was the first such research conference - organised entirely by the early career researchers - being held at LKCMedicine. The event drew inspiration from the well-established traditions of conferences organised by young researchers (PhD and postdoctoral students), that are prevalent elsewhere in Europe and North America. Delivering the opening remarks for the event, LKCMedicine Dean Professor Joseph Sung laid out the conference's aim to host distinguished speakers as well as highlight the research works of young scientists at LKCMedicine and offer them opportunities to present their works alongside distinguished external speakers in the same session.

The conference encompassed a variety of thematic sessions to represent the diverse research interests of our early career researchers as well as the School's programmes in general. The five different session themes this year were Cellular and Neurobiology, Infectious Diseases, Public Health, Technologies in Life Sciences, and Science and Society. The speakers included Professor Rong Li, Professor Hongyan Wang and Professor Thorsten Wohland from the National University of Singapore; Associate Professor David Lye and Associate Professor Lim Su Chi from the National Healthcare Group (National Centre of Infectious Diseases and Khoo Teck Puat Hospital respectively); and Associate Professor Hallam Stevens from Nanyang Technological University. Alongside the guest speakers, there were twelve talks presented by the School's early career researchers. In addition, there were two poster and networking sessions featuring nine postersdebuting for the first time. For participants joining the event virtually, the posters were embedded into the presenters' audio narration.

This year, the participation was limited to the early career researchers from the School due to the restrictions imposed by the pandemic. However, it is hoped that this will become an annual event and subsequent editions will attract postdoctoral and PhD students from other institutions, making the event a crucible for fruitful academic discourses and potential collaborations. Two PhD students, Ms. Tay Kai Yi (Christine Cheung lab) and Ms. Ethiraj Lalith Prabha (Tom Carney lab) won the best oral and poster presentation awards respectively. The achievements clearly demonstrated the calibre and high-quality research works of our doctoral researchers. In conjunction with the conference, LEARN also had our first ever Annual Award Ceremony to recognize the outstanding contribution from LKCMedicine young researchers. Awards were presented in three categories .The awards were presented to the winners by LKCMedicine Vice Dean (Research) Professor Lim Kah Leong and Assistant Dean (Research) Associate Professor Kevin Pethe. The two-day event was concluded by LEARN's mentor, Associate Professor Kevin Pethe, who expressed his strong belief in the young scientists from LKCMedicine to put forward vibrant ideas and stay forefront in the medical research. He also appreciated the presence of all the speakers and audience amidst the COVID-19 pandemic and looked forward to meeting the participants in future LEARN events. The winners were:



DR BILGE ERCAN YASUNORI SAHEKI LAB MENTORSHIP AWARD

> DR NG CHUN YI CHRISTINE CHEUNG LAB MENTORSHIP AWARD





DR ALVIN CHEW BING LIANG LUO DAHAI LAB COMMUNITY SERVICE AWARD

> DR HARSHA MAHABALESHWAR TOM CARNEY LAB COMMUNITY SERVICE AWARD (JOINT WINNER)





DR GIUSEPPE D' AGOSTINO SARAH LANGLEY LAB

COMMUNITY SERVICE AWARD (JOINT WINNER) DR DORRA

DR DORRAIN LOW YANWEN JOHN CHAMBERS LAB RESEARCH EXCELLENCE AWARD





DR LOUISA CHAN LAURENT RENIA LAB RESEARCH EXCELLENCE AWARD

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GRADUATE STUDENTS NEWS



TAY KAI YI

BEST PRESENTATION AWARD AT NFB 2022

Tay Kai Yi, second year LKCMedicine PhD student from Assistant Professor Christine Cheung's lab won, the Best Oral Presentation Award in the 2022 New Frontiers in Biomedicine (NFB) Conference jointly organised by LKCMedicine Early Researcher Network (LEARN) and LKCMedicine Graduate Students' Club (LKCMedicine GSC). Her project titled "Transinteraction of risk loci 6p24.1 and 10q11.21 is associated with endothelial damage in coronary artery disease" focuses on elucidating underlying molecular mechanisms of genetic determinants associated with coronary artery disease using patient-derived cellular models.



ETHIRAJ LALITH PRABHA

BEST POSTER AWARD AT NFB 2022

Ethiraj Lalith Prabha, final year LKC Medicine PhD Candidate from Assistant Professor Tom Carney's lab, won the Best Poster Award in the 2022 New Frontiers in Biomedicine (NFB) Conference for her poster titled "Bisphosphonate related osteonecrosis like lesions in zebrafish: A new comprehensive experimental model to investigate immunological elements". Lalith is an Oral and Maxillofacial surgeon, modelling Bisphosphonate related osteonecrosis of jaw (BRONJ) in zebrafish. Although, there are other animal models reported for this rare disease, their clinical translational impact is questionable. This incited her for developing a new animal model to study the cellular and molecular mechanisms involved. Over the past four years, she has been treating zebrafish with alendronate and investigating the cellular responses. She has exhibited that fish does respond to alendronate treatment, leading to their pharyngeal teeth exfoliation. Further, alendronate treatment decreases osteoclastic activity, similar to that witnessed in humans. This drug also affects nuclear factor kappa B ligand(NF-kB) inflammatory pathway. Therefore, an anti-inflammatory drug targeting the NF-kB pathway could specifically be used to treat BRONJ in zebrafish.

GRADUATE STUDENTS PUBLICATIONS



TAN YAW BIA ASSOCIATE PROFESSOR LUO DAHAI'S LAB

CRYSTAL STRUCTURES OF ALPHAVIRUS NONSTRUCTURAL PROTEIN 4 (NSP4) REVEAL AN INTRINSICALLY DYNAMIC RNA-DEPENDENT RNA POLYMERASE FOLD

NUCLEIC ACIDS RESEARCH

Alphaviruses such as Ross River virus (RRV), chikungaunya virus (CHIKV), Sindbis virus (SINV), and Venezuelan equine encephalitis virus (VEEV) are mosquito-borne pathogens that can cause arthritis or encephalitis diseases. Nonstructural protein 4 (nsP4) of alphaviruses possesses RNA-dependent RNA polymerase (RdRp) activity essential for viral RNA replication. 3D structure of alphavirus nsP4 is not resolved despite its importance for understanding viral RNA replication for antiviral development. In this publication, we report crystal structures of the nsP4 RdRp domain from both RRV and SINV at resolutions of 2.6 Å and 1.9 Å. The RdRp structure appears most closely related to RdRps from pestiviruses, noroviruses, and picornaviruses. Hydrogen-deuterium exchange mass spectrometry and nuclear magnetic resonance showed that in solution, nsP4 is highly dynamic with an intrinsically disordered N-terminal domain. Both full-length nsP4 and its RdRp domain can catalyze RNA polymerization. Structure-guided mutagenesis using a trans-replicase system identified nsP4 regions functionally critical for viral RNA replication.



ETHIRAJ LALITH PRABHA ASSISTANT PROFESSOR TOM CARNEY'S LAB

COLORIMETRIC AND FLUORESCENT TRAP ASSAYS FOR VISUALISING AND QUANTIFYING FISH OSTEOCLAST ACTIVITY

EUROPEAN JOURNAL OF HISTOCHEMISTRY

Osteoclast bone resorbing activity in tissues is visualized using histochemical method, by detection of tartrate-resistant alkaline phosphatase (TRAP) expressed. Due to inaccessibility of commercial acid phosphatase assay kits, homemade conventional TRAP staining kits can be replaced. However, this colorimetric detection method has limitations with quantification in situ and co-labelling with other skeletal markers. Hence, we show that the use of ELF97, a substrate of TRAP, to visualise and quantify osteoclast activity, could provide vital clues to pathogenesis of various bone disorders. This fluorescent TRAP stain is rapid, robust, and stable system to quantify osteoclast activity in zebrafish and is compatible with other fluorescence stains and antibody approaches. Therefore, here we report both simple colorimetric and fluorescent TRAP assays in zebrafish and medaka, two important model organisms for investigating the pathogenesis of bone disorders. Using the fluorescent TRAP stain approach, we reveal that there is heterogenous osteoclastic activity around the base of the zebrafish pharyngeal teeth.

IN CONVERSATION



ASSOC PROF RUPESH AGRAWAL

Associate Professor (Dr) Rupesh Agrawal is a practicing Senior Consultant Ophthalmologist at the National Healthcare Group Eye Institute, Tan Tock Seng Hospital. A/Prof Agrawal has contributed towards significant strides in the improvement of patient care, both nationally and internationally. Currently, he leads the Collaborative Ocular Tuberculosis Study (COTS), Choroidal vascularity index in chorioretinal diseases study (CVI), International Globe and Adnexal Trauma Epidemiology Study (IGATES), Ocular Autoimmune Systemic Inflammatory Infectious Study (OASIS), Biomechanics of Erythrocytes in Diabetic retinopathy study (BED), Erythrogram study (Flow dynamics of labelled erythrocytes in retinal and choroidal circulation) and the Back of the eye drug delivery system study (BOTE). CVI was first coined and invented by A/Prof Agrawal in 2014 and is now a globally recognised tool amongst researchers.

Not only has A/Prof Rupesh Agrawal been actively mentoring his colleagues and juniors in research, but he has also done so for his senior clinician colleagues (both locally and overseas) for an extensive period since 2010. He is the recipient of many grants for numerous basic science projects pertinent to ocular inflammation. He was recently awarded the NHG Research Mentor of the Year Award for his active contributions towards the promotion and development of research amongst junior doctors.

1) What do you hope to achieve through your research?

The most important thing I hope to achieve to improve patient care. Patients are at the centre of all that we do, and it is vital that we keep this in mind when conducting research. Evidence-based medicine has become an integral part of our daily practice. As physicians, we have a duty to provide the best and latest treatment for our patients as we are facing increasing pressure from wellinformed patients. I hope that the research I conduct will translate into improvements in the way we diagnose and treat patients.

I hope that through leading by example and through actively mentoring young junior doctors, my work in research may inspire the next generation of clinicianscientists. I continue to keep reminding myself and my fellow students about: Who are we doing research for? For our patients or for ourselves? It is quite important for the physicians to keep probing themselves and reflecting upon their intention to do or not to do research!

2) What is the support that LKCMedicine has provided you with in your research ?

LKCMedicine has provided me with a faculty role as an Associate Professor, which allows me to have dedicated time for research. I am grateful for the opportunity to collaborate with world-leading scientists at LKCMedicine. I believe that collaboration between scientists is not just advantageous, but necessary. By complementing each other's expertise, we are able to produce research of much greater impact. Looking forward, I also hope to work closely with LKCMedicine to develop the Programme for Ocular Inflammation & Infection Translational Research (PROTON), a programme focusing on the study of intraocular inflammatory and infectious disease which I hope to set up within LKCMedicine.

3) Are there current or past projects with LKCMedicine faculty?

Many! I work with Assistant Professor Bernett Lee, an expert on biomedical informatics, on two large database projects that I am working on – IGATES and OASIS. I work with Professor Leopold Schmetterer on ocular imaging and several publications on choroidal imaging. Also, I am supported and mentored by Associate Professor Kevin Pethe for my Clinician Scientist Award on my project related to ocular tuberculosis. As my primary sub-specialty is in intraocular infections, I also work closely with colleagues specialising in Infectious Disease. I have worked with Associate Professor David Lye on projects assessing COVID-19 viral shedding and infectivity of tears as well as with Professor Leo Yee Sin on projects looking at the HIV, Zika and Dengue viruses.

4) What were some of the challenges you face in your research and how did you overcome it?

As all researchers will know, grant applications can be taxing but I find the energy to tackle them by always reminding myself of the greater purpose of my research – which is my desire to improve patient care. Working on numerous projects at once can also be a challenge. Hence I surround myself with an excellent team of like-minded people to work together towards a common goal, ranging from Professors to medical students. The energy and enthusiasm that these individuals bring inspire me, and without them it will definitely not be possible to take such a large number of projects forward at the same time.

5) Any advice for aspiring junior scientists?

Firstly, remember the greater purpose for why you conduct research. Research should not be something that one does to build their resume or portfolio. Instead, it should be because you want to improve patient care, and because of the duty that you have towards science and the community around you.

Secondly, be curious. Research questions are generated from clinical need, and this can only be done if you are constantly thinking of how things can be done better. In your daily practice, be curious and always question the status quo. Instead of just following clinical guidelines, think about what is being done and what is still unknown that could potentially improve patient care.

Thirdly, have a collaborative spirit. Interact with a wide variety of people – clinicians, scientists, students etc. This will help you broaden your thinking and help you see things from a variety of perspectives apart from your own. It can also open your doors to collaborations that are an important part of scientific research.

Lastly, have a positive attitude. In research, nothing is a small or demeaning task. Whether you are involved in a more physically laborious task such collecting patient data, or a more mentally strenuous task like data analysis, each part of the process is equally important and equally impactful. Always have a positive mindset towards what you are doing, and remind yourself of the potential impact that you are making for your patients through your efforts. This will bring you a long way in your journey in research.

Identify one research question and don't give up until you solve it! Allow yourself to be a beginner. No one starts off being excellent. We may just be at our beginnings of a better future.

A PUBLICATION BY LEE KONG CHIAN SCHOOL OF MEDICINE

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