

Young Scientists' Symposium 2026

Jointly organised by



Singapore Society for
Biochemistry and Molecular Biology



Sponsored by

**National University of Singapore,
Department of Biochemistry**

Singapore National Academy of Science (SNAS)

Young Scientists' Symposium 2026

ACKNOWLEDGEMENTS

The organisers would like to express their thanks to:

- The staff and student participants of the 5 polytechnics for their support and participation
- The oral and poster judges for their time and valuable comments
- Our Sponsors: Department of Biochemistry, National University of Singapore, and Singapore National Academy of Science (SNAS)
- The Emcees, Ms Hafnaa Jainullabudeen and Ms Arabella Violette Aumentado Alturas (Republic Polytechnic)
- Our photographer, Mr Soh Kai Fong Jonathan, and student support staff, Ms Annushree Nair (Republic Polytechnic)

Young Scientists' Symposium 2026



FOREWORD

Dear students,

Welcome to the Young Scientists' Symposium 2026. I am happy that you have decided to participate in this symposium and I hope that it will be a fun and rewarding event for you.

Having completed your final year projects, you have probably realized that in order to succeed in the future, it will not be enough to just accumulate more knowledge. It is even more important to gain experience, independence and various skills, including the ability to write and present. During your final year projects and internships, you have probably also realized that what determines the outcome is to a large part your initiative to come up with new ideas, learn new things, and overcome difficulties. Similarly, in the future, after moving on from your Poly, you will no longer be in the passenger seat, but driving your own route to become successful, happy and content. I believe that including the symposium in your journey is a good choice, as it will hopefully provide you with new experiences and prompt you to think (even) more about your future.

So thank you for participating in this symposium! I would also like to take this opportunity to thank all the people who made this event possible, including our invited speakers, oral and poster presentation judges, your passionate lecturers, the dedicated staff from Science

Centre, in particular Ms Kelly Yeng and Mrs Anne Dhanaraj, the emcees Ms Hafnaa Jainullabudeen and Ms Arabella Violette Aumentado Alturas, and the enthusiastic members of the organizing team, including Dr Sun Guang Wen, Dr Yew Wen Shan, Dr Chua Yee Liu, and Ms Vani Oktavia Sugiharto. Thank you!

Thilo Hagen

Vice President, Singapore Society for Biochemistry and Molecular Biology, Associate Professor, Department of Biochemistry, National University of Singapore

Young Scientists' Symposium 2026

ORGANISING COMMITTEE

Thilo HAGEN (SSBMB Vice President)

SUN Guang Wen (SSBMB)

YEW Wen Shan (SSBMB President)

CHUA Yee Liu (NUS)

Sharon LIM (SSBMB)

LEE Yun Hwa (SSBMB)

Kelly YENG (SCB)

Young Scientists' Symposium 2026

ORAL JUDGES

Dr Chen Ying

Senior Research Scientist
Institute of Molecular and Cell Biology, A*Star

Dr Guan Shou Ping

Senior Research Fellow
Centre for Healthy Longevity, NUS

POSTER JUDGES

Dr Miao Huang (TP)

Dr Subramaniam Gurusamy (NYP)

Dr Calista Ng (RP)

Dr Paul Chen (RP)

Dr Tan Shixiong (RP)

Dr Li Huan (TP)

Dr Simon Tan Kian Hwa (SP)

Dr Tee Jie Kai (SP)

Dr Choy Weng Keong (NP)

Dr Tee Jie Kai (SP)

Liew Rou Shen (NYP)

Dr Harini Mohanram (NYP)

Dr Syed Musthaq Syed Khader (TP)

Dr Elvis Chua (NUS)

Dr Lim Yan Ping (NUS)

Dr Woo Jun Yung

Dr Clara Koh (NUS)

Dr Charlene Fong

Don Sim (NUS)

Yong Hong Xi (NUS)

Wayne Lim (NUS)

YOUNG SCIENTISTS' SYMPOSIUM 2026

Thursday, 19 March 2026

The Marquee @ Science Centre Singapore

SCIENTIFIC PROGRAMME

0830 Registration and Poster setup

0915 **Opening of Symposium:**

Thilo Hagen

*National University of Singapore, Vice President,
Singapore Society for Biochemistry and Molecular
Biology*

0940 **Oral Presentation 1:**

Chloee Chong Jing Yu

Nanyang Polytechnic

**Shear-Aligned Bioprinting of Chitosan Hydrogels
for Programmable, Multidirectional Actuation**

1005 **Breakfast**

1035 **Oral Presentation 2:**

Hrih Tay Ching Hwee

Temasek Polytechnic

**The Role of URP Signalling Pathway in Spine Axis
Determination in Zebrafish**

1100 **Invited speaker 1:**

Amos Sit

*National University of Singapore Graduate from 2024
and Singapore Polytechnic Graduate from 2019*

1130 **Oral Presentation 3:**

Megan Wong Shi Jie

Singapore Polytechnic

**Exploring the Differential Killing Effects of
Mitochondrial-Targeting & Non-Mitochondrial-
Targeting Drugs in Different Growth Mediums**

1155 **Poster Session 1**

1230	Lunch
1315	Changing of the posters
1325	Oral Presentation 4 Ignacia Nathar Yi Ni Si <i>Republic Polytechnic</i> Insect-Derived Antimicrobial Extracts Provide Dual-Action Protection in <i>Brassica</i> Crops via Direct Pathogen Inhibition and Immune Priming
1350	Oral Presentation 5 Sethu Ananthakrishnan Sanjith <i>Ngee Ann Polytechnic</i> Understanding Host Factors in <i>Danio rerio</i> that Regulate Alphavirus Infection
1415	Poster Session 2 and tea
1540	Three Minute FYP Presentation Session 1. Janelle Sim Shi Min (<i>Singapore Polytechnic</i>) 2. Joachim Mejia Lexa (<i>Temasek Polytechnic</i>) 3. Lee Jie Ting Jorene (<i>Republic Polytechnic</i>) 4. Lim Xin Hui, Lim Jun Ming Denzil (<i>Ngee Ann Polytechnic</i>) 5. Mervin Woon Jie En (<i>Nanyang Polytechnic</i>) 6. Nathan Chan Zhi Yan (<i>Temasek Polytechnic</i>) 7. Nurul Huda Binte Helmi (<i>Ngee Ann Polytechnic</i>) 8. Parashu Raam Subramanian (<i>Republic Polytechnic</i>) 9. Tan Yan Wei Justin (<i>Singapore Polytechnic</i>) 10. Yuki Lee Sum Yong (<i>Nanyang Polytechnic</i>)
1625	Vote for best Three Minute FYP presentations
1640	Prize presentations
1650	Close of Symposium

YSS2026 Prizes

SNAS Oral Distinction Prize*	\$350
Oral Presentation Merit Award (first runner-up)	\$200
Poster Presentation Merit Awards	\$100 each
Three Minute FYP Best Presenter Award	\$150
Three Minute FYP Merit Award (first runner-up)	\$100

*sponsored by Singapore National Academy of Science

LIST OF ORAL PRESENTATIONS

No	Authors / Project title	Page
O1	<p>SHEAR-ALIGNED BIOPRINTING OF CHITOSAN HYDROGELS FOR PROGRAMMABLE, MULTIDIRECTIONAL ACTUATION</p> <p><u>Chloee Jing Yu CHONG</u>^{a,b}, Sirawit PRUKSAWAN^a, FuKe WANG^b</p> <p><i>^aInstitute of Materials Research and Engineering (IMRE), Agency for Science, Technology, and Research (A*STAR), 2 Fusionopolis Way, Innovis #08-03, Singapore 138634, Republic of Singapore</i></p> <p><i>^bNanyang Polytechnic, 180 Ang Mo Kio Avenue 8, Singapore, 569830, Republic of Singapore</i></p>	28
O2	<p>THE ROLE OF URP SIGNALLING PATHWAY IN SPINE AXIS DETERMINATION IN ZEBRAFISH</p> <p><u>Hrih Tay Ching Hwee</u>^a, Dheeraj RAYAMAJHI^b, Sudipto ROY^{b,c,d}</p> <p><i>^aDiploma in Medical Biotechnology, School of Applied Science, Temasek Polytechnic, ^bInstitute of Molecular and Cell Biology, A*STAR, Singapore,</i></p> <p><i>^cDepartment of Biological Sciences, National University of Singapore, Singapore, ^dDepartment of Pediatrics, National University of Singapore, Singapore</i></p>	29
O3	<p>EXPLORING THE DIFFERENTIAL KILLING EFFECTS OF MITOCHONDRIAL-TARGETING & NON-MITOCHONDRIAL-TARGETING DRUGS IN DIFFERENT GROWTH MEDIUMS</p> <p><u>Megan WONG Shi Jie</u>^a, DENG Lih Wen^b</p> <p><i>^aDiploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651</i></p>	30

^bDepartment of Biochemistry, National University of Singapore, 8 Medical Drive Singapore 117597

O4 INSECT-DERIVED ANTIMICROBIAL EXTRACTS PROVIDE DUAL-ACTION PROTECTION IN BRASSICA CROPS VIA DIRECT PATHOGEN INHIBITION AND IMMUNE PRIMING 31

Ignacia NATHAR Yi Ni Si^{a*}, WANG En Qi^{a*}, FONG Siew Lee^b, TEO Shuan Haob and WU Hui-Wen^a

^aSchool of Applied Science, Republic Polytechnic, Singapore; ^bAgriculture Research and Innovation Centre, Republic Polytechnic

O5 UNDERSTANDING HOST FACTORS IN *DANIO RERIO* THAT REGULATE ALPHAVIRUS INFECTION 32

SETHU ANANTHAKRISHNAN Sanjith¹, Claire HONEY², NEW Jen Yan¹, Guillaume CARISSIMO²

*¹Ngee Ann Polytechnic, ²A*STAR Infectious Diseases Labs*

LIST OF THREE MINUTE FYP PRESENTATIONS

No	Authors / Project title	Page
1	<p>ESTABLISHING A VIRUS-INDUCED GENE SILENCING SYSTEM IN CAPSICUM</p> <p><u>SIM Janelle Shi Min^a</u>, TAN Jing Heng Javier^b, LIU Qian^b, YANG Rui^b, JIANG Dan Hua^b</p> <p><i>^aDiploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651, ^bTemasek Life Sciences Laboratory, 1 Research Link, Singapore 11760</i></p>	34
2	<p>EFFECTIVENESS OF CHITINOLYTIC BACTERIA FROM GUT OF JOHN'S SNAPPER (<i>LUTJANUS JOHNI</i>) ON REDUCING CHITIN CONTENT IN INSECT MEAL</p> <p><u>JOACHIM Mejia Lexa^a</u>, NG Shi En^a, TEO Yong Jian Glendon^a</p> <p><i>^aTemasek Polytechnic</i></p>	35
3	<p>INVESTIGATING THE IMPACT OF A PERICONCEPTION NUTRITIONAL INTERVENTION ON CHILD BIOMARKERS OF OBESITY</p> <p><u>LEE Jie Ting Jorene^{1,2}</u>, Hannah Ee Juen YONG², TAN Shi-Xiong¹</p> <p><i>¹School of Applied Science, Republic Polytechnic, Singapore 738964, ²Institute for Human Development and Potential, Agency for Science, Technology and Research, Singapore 117609</i></p>	36
4	<p>STATISTICAL ANALYSIS OF FACTORS INFLUENCING DISEASE OUTCOMES</p> <p><u>LIM Xin Hui, LIM Jun Ming Denzil</u>, Wayne FORDAY</p> <p><i>Ngee Ann Polytechnic</i></p>	37

5	FORCED DEGRADATION OF A BLOCK COPOLYMER TO GUIDE STABILITY CONSIDERATIONS IN POLYMERIC NANOPARTICLE FORMULATION DEVELOPMENT	38
	<u>Mervin WOON Jie En</u>^{a,b}, Wei Xiang POH^b, Shaoqiong LIU^{b*}	
	<i>^aSchool of Applied Chemistry, Nanyang Polytechnic, Singapore, ^bACM Biolabs, Singapore</i>	
6	DEVELOPMENT AND VALIDATION OF A HPTLC METHOD FOR CANNABINOID ANALYSIS ON THE CAMAG® HPTLC PRO.	39
	<u>Nathan CHAN</u>^a, Sylvia TAN^b, Ying Ying TAN^b, Reenie CHIN^b, Mary LIM^b, Li Wen PHANG^b, Filbert ANG^a, LI Huan^a	
	<i>^aTemasek Polytechnic, ^bHealth Sciences Authority</i>	
7	RISK DETERMINANTS OF ILL-HEALTH	40
	<u>HELMI Nurul Huda</u>, FORDAY Wayne Lee	
	<i>Ngee Ann Polytechnic</i>	
8	SEX DIFFERENCES IN MUSCLE FIBRE DISTRIBUTIONS AND SARCOPENIC MEMBRANE DAMAGE	41
	<u>Parashu Raam SUBRAMANIAN</u>^a, WON Choong Yun^a, Dr TSAI Shih-Yin^b	
	<i>^aSchool of Applied Science (SAS), Republic Polytechnic, Singapore, ^bDepartment of Physiology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore</i>	
9	Capturing GPCR Signalling in Action: Engineering a Cryo-EM Stabilisation Platform for Drug Target Studies	42
	<u>TAN Yan Wei Justin</u>^a, NIU Mu Yuan^b, SHEN Xuan^b, TAN Yong Zi^b	

^aDiploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651

^bDepartment of Biological Sciences, National University of Singapore, Block S1A, Lee Wee Kheng Building, Level 5 Right Wing # 05-19, 14 Science Drive 4 Singapore 117543

10 STIMULI-ACTIVATED SOFT ACTUATOR VIA IONIC 43
ASSEMBLY OF SHEAR-ALIGNED CHITOSAN

Yuki Sum Yong LEE^{1,2}, Sirawit PRUKSAWAN² and FuKe WANG²

¹Nanyang Polytechnic, 180 Ang Mo Kio Avenue 8, Singapore, 569830, Republic of Singapore

*²Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology, and Research (A*STAR), 2 Fusionopolis Way, Innovis #08-03, Singapore 138634, Republic of Singapore*

LIST OF POSTER PRESENTATIONS (SESSION 1)

No	Authors / Project title	Page
P1	EFFECTIVENESS OF CHITINOLYTIC BACTERIA FROM GUT OF JOHN'S SNAPPER (<i>LUTJANUS JOHNI</i>) ON REDUCING CHITIN CONTENT IN INSECT MEAL <u>JOACHIM Mejia Lexa</u>^a, NG Shi En^a, TEO Yong Jian Glendon^a <i>^aTemasek Polytechnic</i>	45
P2	Plasma bio-engineered hybrid solid-hydrogel dressing for wound healing <u>Jun Tong GOH</u>^a, Priscilla LIM Lay Keng^b, Declan LUNNY^{b,c}, Masoud ZHIANMANESH^d, Kenneth LAY Wei Jian^b, Behnam AKHAVAN^d, Carine BONNARD^{b,c} <i>^aDiploma in Biomedical Sciences, School of Chemical and Life Sciences, Singapore Polytechnic, Singapore, ^bModel Development, A*STAR Skin Research Labs</i>	46
P3	STIMULI-ACTIVATED SOFT ACTUATOR VIA IONIC ASSEMBLY OF SHEAR-ALIGNED CHITOSAN <u>Yuki Sum Yong LEE</u>^{1,2}, Sirawit PRUKSAWAN² and FuKe WANG² <i>¹Nanyang Polytechnic, 180 Ang Mo Kio Avenue 8, Singapore, 569830, Republic of Singapore</i> <i>²Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology, and Research (A*STAR), 2 Fusionopolis Way, Innovis #08-03, Singapore 138634, Republic of Singapore</i>	47
P4	COMPARATIVE STUDY BETWEEN 3D PRINTED FENOFIBRATE TABLETS AND COMPRESSION-BASED FENOFIBRATE TABLETS MADE FROM A SINGLE PUNCH TABLET PRESS	48

Elise LIM Wen Hui^a, Kayli Safiah BRUNSON^a, KO Yu Xuan^a, NG Si Qi Denise^a, XIE Yiming^a, Josefina SEOW^a

^aRepublic Polytechnic

P5 ASSESSMENT OF MACRONUTRIENT INTAKE USING 24-HOUR DIETARY RECALL DATA & EVALUATION AGAINST THE ACCEPTABLE MACRONUTRIENT DISTRIBUTION RANGES 49

MUHAMMAD Irfan Bin Jamalludin^a, Irene WANG Min Xin^a, Ethel CHEE Yan Lin^a, Dr Theresia Handayani MINA^b, Dr Antara CHAKRABORTY^a

^aRepublic Polytechnic, ^bNanyang Technological University Lee Kong Chian School of Medicine

P6 EVALUATION OF THE PROTEGO NOODLES FOR PREBIOTIC POTENTIAL 50

TAN Yu Wei Menfred^{a,b}, CHOO Mei Shan Charlotte^a, LEONG Florence^b, HENG Kiang Soon^a, HON Sook Mei^a

^aRepublic Polytechnic, ^bKosmodehealth

P7 DEVELOPMENT AND VALIDATION OF A HPTLC METHOD FOR CANNABINOID ANALYSIS ON THE CAMAG® HPTLC PRO. 51

Nathan CHAN^a, Sylvia TAN^b, Ying Ying TAN^b, Reenie CHIN^b, Mary LIM^b, Li Wen PHANG^b, Filbert ANG^a, LI Huan^a

^aTemasek Polytechnic, ^bHealth Sciences Authority

P8 TOWARDS SUSTAINABLE LAB PRACTICES: EXAMINING STERILIZATION METHODS FOR MICROPIPETTE TIP REUSE 52

CHNG Rui Ting, CHOKKA Swetha Pranuthi, Navya Shree VENKAT, TOH Jin Yuan, Cherry CHAN, Siti Hamimah HAMID

Republic Polytechnic

- P9** **STUDYING EPIDEMIOLOGY OF BONE HEALTH IN ASIANS USING MUSCULOSKELETAL IMAGING (PQCT SCANNER)** **54**
- Dr. MYA Thway Tint^a, ONYEKABA Regin^{ab}, Wynn TEO Yi Rou^b, Naili Malisa Binti ABDUL RAHMAN RAIS CHONG^b, Danielle Ashleigh ROSETE ASHRAF^b, Thanya D/O MAGENDRAN^b, and Joe TAY^b**
- ^aA*STAR Institute for Human Development and Potential, Growing Up in Singapore Towards healthy Outcomes (GUSTO), ^bRepublic Polytechnic School of Applied Science*
- P10** **INVESTIGATING THE NEUROTOXICITY OF MUTANT TAU USING A DROSOPHILA MODEL OF ALZHEIMER'S DISEASE** **56**
- Kubendiran Savita Sri^a, ONG Chin Tong^b**
- ^aDiploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651*
- ^bOng Ching Tong Laboratory, Temasek LifeSciences Laboratory, 1 Research Link, Singapore 117604*
- P11** **OPTIMISING SERUM-FREE MEDIA FORMULATION FOR CULTIVATED MEAT APPLICATION** **57**
- GOH Kai Jun Benedict^a, LEUNG Chak Ming^b**
- ^aTemasek Polytechnic School of Applied Science Medical Biotechnology, ^bMeatiply Pte Ltd*
- P12** **OVEREXPRESSION OF BLOWFLY (*Lucilia sericata*) ANTIMICROBIAL PEPTIDES (AMPs) USING AGRO-TRANSIENT EXPRESSION STRATEGY AND EVALUATION OF THEIR EXPRESSION IN PLANTS** **58**
- Jayden TAN Xun Zhi^a, Blandon TAN You Liang^a, KOH Zi Yi^a, A. Sai Gughan^a, FONG Siew Lee^b, TEO Shuan Hao^b, Kenny WONG Siew Cheong^a, and WU Hui-Wen^a**
- ^aSchool of Applied Science, Republic Polytechnic; ^bAgriculture Research and Innovation Centre, Republic Polytechnic*

P13	CHARACTERISATION OF WOLBACHIA-INFECTED AEDES AEGYPTI <u>SIM Xuan Hui Megan</u>^a, NG Sui Hann^b, CAI Yu^b <i>^aSingapore Polytechnic, ^bTemasek Life Sciences Laboratory</i>	59
P14	ESTABLISHING A VIRUS-INDUCED GENE SILENCING SYSTEM IN CAPSICUM <u>SIM Janelle Shi Min</u>^a, TAN Jing Heng Javier^b, LIU Qian^b, YANG Rui^b, JIANG Dan Hua^b <i>^aDiploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651, ^bTemasek Life Sciences Laboratory, 1 Research Link, Singapore 11760</i>	60
P15	FORCED DEGRADATION OF A BLOCK COPOLYMER TO GUIDE STABILITY CONSIDERATIONS IN POLYMERIC NANOPARTICLE FORMULATION DEVELOPMENT <u>Mervin WOON Jie En</u>^{a,b}, Wei Xiang POH^b , Shaoqiong LIU^{b*} <i>^aSchool of Applied Chemistry, Nanyang Polytechnic, Singapore, ^bACM Biolabs, Singapore</i>	61
P16	EXPLORING THE USE OF MACSIMA PLATFORM IN COMPLEMENTING CONVENTIONAL IMMUNOHISTOCHEMISTRY (IHC) DIAGNOSTIC METHODS <u>Zonell LIM EnQi</u>^a, YU Jia^b, Afifah Binte MUSTAFFA^b, Edwin CHEW^b, GOH Jian Yuan^b, AW Sze Jet^b and Kenneth CHANG^b <i>^aDiploma in Medical Biotechnology, School of Applied Science, Temasek Polytechnic, ^bDepartment of Pathology and Laboratory Medicine, KK Women's and Children's Hospital</i>	62

P17	NON-INVASIVE ENVIRONMENTAL MONITORING OF VIBRIO ALGINOLYTICUS INFECTION IN SHRIMP AQUACULTURE PRODUCTION SYSTEMS <u>LIM Xin Mei^a, NG Wan Jie^a, IMAN Yasmin Binte Zulkhairi^a, PADMANABHAN Saravanan^b</u> ^a Diploma in Veterinary Technology, ^b Aquaculture Innovation Centre (AIC), School of Applied Science, Temasek Polytechnic	63
P18	OPTIMIZATION AND VALIDATION OF A HIGH-THROUGHPUT SCREENING ASSAY TO IDENTIFY SMALL-MOLECULE INHIBITORS AGAINST DRUG-TOLERANT PERSISTENT (DTP) CELLS IN LUNG CANCER <u>Brice LEE^a, Doris TEE^b</u> ^a Temasek Polytechnic, ^b Experimental Drug Development Centre (EDDC)	64
P19	SCREENING AND EVALUATING INSECT-DERIVED COMPOUNDS AGAINST FUNGAL PATHOGEN (<i>Fusarium oxysporum</i>) <u>SEOW Aristotle Bonganay^a, NG En Qi Zoe^a, ZULKEPLI Muhammad Naqib^a, YADAV Nitish S/O Praduman^a, WU Hui-Wen^a, FONG Siew Lee^b and TEO Shuan Hao^b</u> ^a School of Applied Science, Republic Polytechnic; ^b Agriculture Research and Innovation Centre, Republic Polytechnic	65
P20	DETERMINING THE EFFECTS OF SEQM-RPE1 AND SEQM-RPE6 ON CELLULAR PROLIFERATION AND ADIPOGENESIS <u>Ashlee Eliza TAN, Hazel KOH Jia Xin, Muhd Syukri SHAH S/O Muhd Fitri Vetri, TEE Hui Xuan, WONG Kak Ming, TAN Shixiong</u> <i>Republic Polytechnic</i>	67

- P21** **EXPLORING THE EFFECTS OF GUT COMMENSAL SECRETOME ON COLORECTAL CANCER** **68**
Brindamathi D/O GOVINDARAJ V^a, CHUA Xin Ying^a, LEE Jie Ying^a, YET Zu Yi Lydia^a, TAN Shi Yuan Shermaine^a, MA Shaokang^a, Siti HAMIMAH^a
^aRepublic Polytechnic
- P22** **EARLY STRUCTURAL AND CORONARY ARTERY CHANGES ASSOCIATED WITH METABOLIC BURDEN AND OBSTRUCTIVE SLEEP APNEA** **69**
THE Hui Ing Idelle Teddyatmaja^a, CHUA EnCi^b
^aDiploma in Medical Biotechnology, School of Applied Science, Temasek Polytechnic, ^bAsian Heart and Vascular Centre
- P23** **CORRELATION OF BDMAX MULTIDRUG RESISTANT TUBERCULOSIS (MDR-TB) RESISTANCE MARKERS WITH PHENOTYPIC DRUG SUSCEPTIBILITY TESTING (pDST) AND WHOLE GENOME SEQUENCING (WGS)** **70**
LIM Rui En Dora^a, NG Yi Kai^b, Nathan LIANG Hao Ping^b, SNG Li-Hwei^b
^aDiploma in Medical Biotechnology, Temasek Polytechnic, ^bCentral Tuberculosis Laboratory, Singapore General Hospital
- P24** **EVALUATING BOTANICAL PRESERVATIVES TO ENHANCE MICROBIOLOGICAL SAFETY AND EXTEND THE SHELF LIFE OF POST-HARVEST LITOPENAEUS VANNAMEI SHRIMP** **71**
LAU Zi Suan¹, Tara GOH¹, MIAO Huang², James LIM Yong Kian^{3,4}
¹Diploma in Veterinary Technology, School of Applied Science, Temasek Polytechnic Singapore; ²Centre for Urban Sustainability, School of Applied Science, Temasek Polytechnic, Singapore; ³Centre of Aquaculture and Veterinary Science School of Applied Science, Temasek Polytechnic, Singapore; ⁴Future Foods

Domain, School of Applied Science, Temasek Polytechnic Singapore

P25 Capturing GPCR Signalling in Action: Engineering a Cryo-EM Stabilisation Platform for Drug Target Studies 73

TAN Yan Wei Justin^a, NIU Mu Yuan^b, SHEN Xuan^b, TAN Yong Zi^b

^aDiploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651; ^bDepartment of Biological Sciences, National University of Singapore, Block S1A, Lee Wee Kheng Building, Level 5 Right Wing # 05-19, 14 Science Drive 4 Singapore 117543

P44 FORMULATION OF 3D PRINTED PERSONALISED NUTRACEUTICALS USING SUSTAINABLE MATERIALS 94

Yu Kaijie, Chua Xuan Ru Cheryl, Muhammad Firdaus Bin Muhammd Faizal, Soh Jing Rong Jovan, Loh Jia Wei, Josefina Seow, Felicia Liew

Republic Polytechnic

P45 Microbial cell factory for retinoid biosynthesis 95

Cheng Rui Yang Joshua, Chiradip Chatterjee, Chen Xixian

School of Applied Science, Republic Polytechnic, Singapore Institute of Food and Biotechnology innovation, ASTAR

LIST OF POSTER PRESENTATIONS (SESSION 2)

- P26** **TOWARDS SUSTAINABILITY: ELECTROCATALYTIC CONVERSION OF BENZENE TO PHENOL** **74**
LEE Yue Qi^a, LEOW Wan Ru^{b,c}
*^aTemasek Polytechnic, ^bInstitute of Sustainability for Chemicals, Energy and Environment (ISCE2), ^cAgency for Science, Technology and Research (A*STAR), ^cSchool of Chemistry, Chemical Engineering and Biotechnology, Nanyang Technological University*
- P27** **ADVANCING HEALTH AND TASTE WITH ALLULOSE AS A SUGAR SUBSTITUTE: NOVEL FORMULATION AND PROCESSING** **75**
J.S Harinath^a, Putri NUR SHAZLIN BINTE ALI^a, Alaina NORA BINTE NORAZMI^a, Sarah FATIMAH GHAZALI^a, Haneeza IQLIMA BINTE HAZILAH^a, Dr Susmita BANDYOPADHYAY^a, Dr Chiradip CHATTERJEE^a
^aRepublic Polytechnic
- P28** **OPTIMIZING PHARMACY WORKFLOW WITH WEIGHT-BASED INVENTORY MANAGEMENT** **76**
Tiara Muraledharan Nair^{*}, LAU Hou Ying Angelina^{*}, WEE Qian Ying^{*}, Eunice TAN Hwee Chee^{*}, Nadia Natasha Binte ZULKIFLI^{*}, Jin Mengqi
^aRepublic Polytechnic, ^bWoodlands Health
- P29** **MOLECULAR SCREENING OF TOMATO CULTIVARS SUSCEPTIBLE TO TOMATO YELLOW LEAF CURL VIRUS (TYLCV) AND OPTIMIZATION OF VIRAL INOCULATION FOR EARLY DIAGNOSTIC ASSAYS** **77**
Pius TANG Kai Jie^a, Muhammad Aizzel bin MOHAMED FAUZI^a, SEAH Zhi Xuan^a, Aikin Aiman bin ABDULLAH^a, Jacob OMAR CASHA^a, FONG Siew Lee^b, WU Hui-Wen^a, and GAN Eng Seng^a

*^aSchool of Applied Science, Republic Polytechnic;
^bAgriculture Research and Innovation Centre, Republic Polytechnic*

P30 DEVELOPMENT OF A GENERATIVE AI CHATBOT FOR NATURAL LANGUAGE PATIENT TRIAGE 78

Natalie CHEONG, Lenice NEO, WONG Ru Bing, Shannon LAU and Joan TAY

Republic Polytechnic

P31 Design, synthesis and modification of Biopolymers for green cosmetic products 79

Aloysius ONG Zhi Hao^a, ROY Susmita^b

^aTemasek Polytechnic, ^bGreenitio

P32 Reimagining Food: Integrating Bioprinted Texture and Food-Derived Bioinks for Cultivated Meat 80

Min Yu Jacia LEE^a, Sylvia Shi Qi TAN^a, Nadyr Nabil Bin KHAIRUDIN^a, Wei Hong LAW^a, Jie Min ANG^a, Clarisse Wan Qian ZHUO^a, Manchao WU^{a,*}, Louis Jun Ye ONG^{a,b,*}

^aTemasek Polytechnic, School of Applied Sciences. 21 Tampines Avenue 1, Singapore 529757, ^bFuture Food Domain, Temasek Polytechnic. Singapore 529757

P33 PREVALENCE AND RISK FACTORS OF UNDIAGNOSED NEUROPATHY IN PEOPLE WITH DIABETES IN SINGAPORE 82

Shamsubahurudin SHAMSUDDIN^a, Sanchi DUA AVINASHI^b, Manasi^b, Dinesh NATARAJAN^b, Tosha KALHAN^b, Raina WADHWA^b, CHEW Sher Mein^b, Kavita VENKATARAMAN^b

^aSchool of Applied Science, Medical Biotechnology, Temasek Polytechnic, ^bSaw Swee Hock School of Public Health, National University of Singapore

P34 Comparing the antioxidant effect of Edaravone and Epigallocatechin gallate on a cell culture model of Non-Alcoholic Fatty Liver Disease (NAFLD) 83

**Adrian Amarjeet WILLIAMS^a, Arham Ahmed FIROZ^a,
WONG Yu Da^a, Sanjay S. NAIR^a, THE Kai Ting^a,
TAN Shi-Xiong^a**

*^aRepublic Polytechnic, School of Applied Science,
Diploma in Biomedical Science*

P35 MONITORING PATHOGENIC YEASTS IN BIRD DROPPINGS: A ONE HEALTH APPROACH 84

**Hao-Rong HO^a, Wing-Yan SO^b, Pak-Ting HAU^b, Eddie
Chung-Ting CHAU^b, Chi-Ching TSANG^c, Franklin
Wang-Ngai CHOW^{b,*}**

*^aSchool of Applied Science, Nanyang Polytechnic,
Singapore; ^bDepartment of Health Technology and
Informatics, The Hong Kong Polytechnic University,
Hong Kong, China; ^cSchool of Medical and Health
Sciences, Tung Wah College, Hong Kong, China*

P36 Molecular Breeding of Leafy Vegetable Varieties 85

**AGNOTE Ezekiel Staples^a, TAN Grace^b, GOH Kasey^b,
DAISUKE Urano^b**

*^aSchool of Chemical and Life Sciences, Singapore
Polytechnic; ^bLaboratory of Urano Daisuke, Temasek
Life Science Laboratories*

P37 ESTABLISHING AND COMPARING HAEMATOLOGICAL REFERENCE VALUES OF SWISS WEBSTER, C57BL/6, AND NSG MICE 86

CHONG Rachael^a, Sebastian Jose DAVID^b

*^aTemasek Polytechnic, ^bSingHealth Experimental
Medicine Centre*

P38 SCREENING AND EVALUATION OF INSECT-DERIVED COMPOUNDS AGAINST BACTERIAL PATHOGEN (*Pseudomonas syringae* pv. *tomato*) 87

**Ashley ONG Qi Hui^a, Ignacia NATHAR Yi Ni Si^a,
WANG En Qi^a, Irene WANG Min Xin^a, Sarah Athira
Binte Ashraf Stephen FOREMAN^a, FONG Siew Lee^b,
TEO Shuan Hao^b and WU Hui-Wen^a**

^aSchool of Applied Science, Republic Polytechnic, Singapore; ^bAgriculture Research and Innovation Centre, Republic Polytechnic

P39 PHYLOGENETIC DIVERSITY AND PHENOTYPIC PLASTICITY IN TOXIN PRODUCTION BY SYMBIODINIACEAE STRAINS 89

PAU Dominic Joe Jien^a, CEAPA Holly^b, PETROU Katherina^b

^aTemasek Polytechnic, Singapore, ^bPetrou Lab, University of Technology, Sydney

P40 BEYOND THE BEAT: DECIPHERING THE “HEART-BRAIN” LINK IN PALPITATION DIAGNOSIS 90

Zephyr TAN Xuan Qi^a, CHUA En Ci^b

^aDiploma in Medical Biotechnology, Temasek Polytechnic, School of Applied Science, ^bAsian Heart and Vascular Centre

P41 DESIGNING EFFECTIVE PUBLIC EDUCATIONAL APPROACHES TO KIDNEY HEALTH 91

Ethel CHEE Yan Lin^a, Irfath Irshana D/O RIAS^a, Sanjana SHETTY^a, Shakeena SAFRIN Mohamed Thambi^a, TENG Wan Lin^a, MA Zhen^a, Siti NURBAYA Ramli^a, Cherry CHAN^a, Daron NA^b

^aRepublic Polytechnic, ^bNational Kidney Foundation Singapore

P42 Nanoarchitected Collagenous Shark Egg Cases: Structural and Biological Characterization 92

Deekshika Muthiah^{1,2}, Hyok Zing Png^{1,2}, Joey Hui Min Wong¹, Belynn Sim^{1,3}, Xian Jun Loh^{1,3}, Rubayn Goh^{1*}

¹School of Chemical & Life Sciences, Singapore Polytechnic, 500 Dover Rd, 139651, Singapore

*²Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology and Research (A*STAR), 2 Fusionopolis Way, #08-03 Innovis, Singapore 138634, Republic of Singapore*

³*School of Materials Science and Engineering, Nanyang Technological University (NTU), Singapore 639798, Republic of Singapore*

P43 **MITOCHONDRIAL DNA ENRICHMENT FOR AEDES AEGYPTI COMPLETE MITOGENOME SEQUENCING** **93**

SOH Yin Jun^a, Surya Pavan YENAMANDRA^b, LIM Ming Jie^b, Hapuarachichige Chanditha HAPUARACHCHI^b

^a*School of Applied Science, Temasek Polytechnic*

^b*Environmental Health Institute, National Environmental Agency, Singapore*

ORAL PRESENTATIONS

ORAL 1

SHEAR-ALIGNED BIOPRINTING OF CHITOSAN HYDROGELS FOR PROGRAMMABLE, MULTIDIRECTIONAL ACTUATION

Chloee Jing Yu CHONG^{a,b}, Sirawit PRUKSAWAN^a, FuKe WANG^b

^a*Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology, and Research (A*STAR), 2 Fusionopolis Way, Innovis #08-03, Singapore 138634, Republic of Singapore*

^b*Nanyang Polytechnic, 180 Ang Mo Kio Avenue 8, Singapore, 569830, Republic of Singapore*

Hydrogel-based soft actuators commonly rely on anisotropic structures or indirect swelling to induce motion, limiting reversibility and design flexibility. Extrusion-based 3D printing enables the fabrication of complex geometries, yet achieving predictable, reversible anisotropic actuation without permanent fillers remains challenging. Here, a shear-aligned chitosan (CS) hydrogel actuator in which anisotropic shape morphing is done directly through extrusion-based bioprinting. As the hydrogel precursor is extruded through the nozzle, shear flow aligns CS chains along the printing direction, and subsequent saturated CaCl_2 immersion induces actuation. Directional stiffening restricts deformation along the printing direction, causing bending perpendicular to alignment. Complex geometries – crosses, four-leaf clovers – exhibit morphing that initiates with perpendicular bending and evolves into curling or twisting depending on geometry. By varying printing orientations within a structure, distinct and localised actuation are achieved, demonstrated by a flower-like geometry with petals curling in opposite directions. Finite element analysis accurately predicts these behaviours. Notably, the hydrogels function as stiffness-adaptive graspers, simultaneously morphing and increasing toughness by up to ~350-fold to securely grip objects, before reversibly softening upon stimulus removal. With this, it enables programmable, multidirectional hydrogel actuation for advanced soft robotics and biomedical applications.

ORAL 2

THE ROLE OF URP SIGNALLING PATHWAY IN SPINE AXIS DETERMINATION IN ZEBRAFISH

Hrih Tay Ching Hwee^a, Dheeraj RAYAMAJHI^b, Sudipto ROY^{b,c,d}

^a*Diploma in Medical Biotechnology, School of Applied Science, Temasek Polytechnic,* ^b*Institute of Molecular and Cell Biology, A*STAR, Singapore,* ^c*Department of Biological Sciences, National University of Singapore, Singapore,* ^d*Department of Pediatrics, National University of Singapore, Singapore*

Adolescent Idiopathic Scoliosis (AIS) is a severe three-dimensional spinal deformity affecting 3-4% of adolescents worldwide, yet its biological aetiology remains largely unknown. Zebrafish serve as a vital model for studying spinal morphogenesis due to significant genetic and biomechanical conservation with humans. Recent studies suggest cilia-driven cerebrospinal fluid flow directs Urotensin (Urp) signalling to maintain spinal straightness. However, research primarily investigates *urp1* and *urp2*, often overlooking other *urp* paralogues. Furthermore, the traditional hypothesis that dorsal muscle contraction acts as the obligate downstream effector remains unproven. This study investigated functional redundancy within the *urp* gene family and evaluated whether active muscle contractility is the true effector. Phenotypes of adult *urp* triple mutants (*urp1*^{-/-}; *urp2*^{-/-}; *uts2d*^{-/-}) were characterised, and developmental *urp* paralogue expression was profiled. To definitively decouple signalling from muscle force, *urp1* overexpression was induced in genetically (*unc45b* mutants) and chemically (Blebbistatin-treated) paralysed embryos.

Adult triple mutants exhibited severe, 100% penetrant scoliosis, while early embryos maintained a straight axis, possibly due to the compensatory developmental expression of paralogues *uts2a* and *uts2b*. Crucially, embryonic *urp1* overexpression induced a robust "Curly Tail Up" (CTU) curvature not only in wild-type controls but also in both completely paralysed models. The persistence of the CTU phenotype despite the total abolishment of functional sarcomeres or myosin II activity definitively decouples actomyosin contractility from Urp-mediated curvature. These results redefine the biological foundation of AIS, establishing that Urp signalling governs early spinal morphology through non-muscular structural mechanisms rather than active muscular tension.

ORAL 3

EXPLORING THE DIFFERENTIAL KILLING EFFECTS OF MITOCHONDRIAL-TARGETING & NON-MITOCHONDRIAL-TARGETING DRUGS IN DIFFERENT GROWTH MEDIUMS

Megan WONG Shi Jie^a, DENG Lih Wen^b

^a*Diploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651*

^b*Department of Biochemistry, National University of Singapore, 8 Medical Drive Singapore 117597*

In vitro drug testing is crucial for preclinical therapeutic evaluation, and culture conditions can significantly impact cellular metabolism and consequently drug response. This raises the possibility that medium-dependent variability may bias conclusions regarding drug efficacy in metabolism-targeting therapeutics.

We investigated whether mitochondrial-targeting drugs exhibit greater sensitivity to growth medium composition compared to non-mitochondrial-targeting chemotherapeutics. Based on prior laboratory observations of differential killing effects between RPMI and DMEM, we compared mitochondrial-targeting agents (doxycycline, BAY-179 and HQNO) against non-mitochondrial-targeting drugs that disrupt DNA replication or mitosis (cisplatin, etoposide and paclitaxel) across multiple cell lines cultured in either medium. Systematic component supplementation was also performed to evaluate the contribution of individual and combinatory media constituents.

The mitochondrial translation inhibitor doxycycline demonstrated significantly greater cytotoxicity in RPMI relative to DMEM across multiple cell lines. This medium-dependent effect was not observed for other mitochondrial complex-targeting agents (BAY-179 and HQNO), nor for non-mitochondrial-targeting drugs. Notably, combinatory supplementation of selected media components produced effects exceeding those of individual components, suggesting combinatory metabolic modulation.

Our findings indicate that growth medium composition selectively influences the efficacy of mitochondrial translation-targeting drugs. This highlights a potential source of bias in metabolism-dependent drug screening and underscores the importance of considering culture conditions when interpreting preclinical drug responses.

ORAL 4

INSECT-DERIVED ANTIMICROBIAL EXTRACTS PROVIDE DUAL-ACTION PROTECTION IN *BRASSICA* CROPS VIA DIRECT PATHOGEN INHIBITION AND IMMUNE PRIMING

Ignacia NATHAR Yi Ni Si^{a*}, WANG En Qi^{a*}, FONG Siew Lee^b, TEO Shuan Hao^b and WU Hui-Wen^a

^a*School of Applied Science, Republic Polytechnic, Singapore;*

^b*Agriculture Research and Innovation Centre, Republic Polytechnic;*

**These authors contributed equally to this work*

The rising prevalence of plant diseases and increasing restrictions on synthetic pesticides have intensified the demand for sustainable, broad-spectrum crop protection strategies. Insect-derived antimicrobial extracts (AMEs) have emerged as promising bioactive crop protection solution due to their chemically diverse compounds and potential to provide both direct antimicrobial effects and host immune activation. This study evaluated the antimicrobial efficacy and plant-protective potential of AMEs, including their ability to induce defence responses against major *Brassica* pathogens.

AMEs were screened *in vitro* against *Fusarium oxysporum* to assess growth inhibition, while their protective efficacy against *Xanthomonas campestris* pv. *campestris* was evaluated *in planta*. Dose–response assays revealed significant, concentration-dependent suppression, with selected extracts exhibiting low minimum inhibitory concentrations and strong antifungal and antibacterial activity. Lead AMEs were subsequently applied as pre-treatments to hydroponically grown *Brassica* plants prior to pathogen challenges. Treated plants displayed markedly reduced disease severity, delayed symptom progression, and improved biomass compared to untreated controls. Molecular analyses showed that AME application induced early transcriptional reprogramming of defense-related genes, including markers associated with systemic acquired resistance (SAR) and induced systemic resistance (ISR). Quantitative expression profiling demonstrated significant upregulation of key immune gene markers within early time points following treatment.

Collectively, the results indicate that AMEs function through a dual mechanism involving direct antimicrobial activity and immune priming of the host plant. These findings demonstrate that insect-derived AMEs represent promising, environmentally responsible bio-protectants and support their further development for integrated disease management in *Brassica* crop production.

ORAL 5

UNDERSTANDING HOST FACTORS IN *DANIO RERIO* THAT REGULATE ALPHAVIRUS INFECTION

SETHU ANANTHAKRISHNAN Sanjith¹, Claire HONEY², NEW Jen Yan¹, Guillaume CARISSIMO²

¹*Ngee Ann Polytechnic*, ²*A*STAR Infectious Diseases Labs*

Alphaviruses, such as Chikungunya virus (CHIKV) pose a significant global health risk; however, the pathogen-host factor interactions responsible for controlling infection remain poorly understood. *Danio rerio* (zebrafish) is a good disease model because they are genetically similar to humans and are optically transparent. In this project, zebrafish were used to investigate the differential viral tropism of genetically modified alphaviruses. Wild-type AB strain zebrafish were infected with CHIKV and a chimeric variant (CHIKV XnsP4), containing the RNA-dependent RNA polymerase (RdRp) of virus X. CHIKV XnsP4 consistently showed a higher proportion of zebrafish exhibiting localization of the virus to the swimbladder of zebrafish during infection. The RdRp is not a structural component of the virus, so its ability to influence viral tropism opens a novel role for non-structural proteins in influencing infection. Additionally, the role of MXRA8A, a well-known alphavirus receptor, and IRF3, a key regulator of the immune pathway, on alphavirus infection in zebrafish were also investigated. Crispants of MXRA8A and IRF3 were generated through the injection of CRISPR/Cas9 with guide RNAs at the single-cell stage of zebrafish development. The two-day old crispant zebrafish embryos were infected with alphaviruses: CHIKV, virus X, and their structural protein swaps. Both MXRA8A and IRF3 had no effect on alphavirus infectivity and tropism, thereby suggesting that zebrafish have other host factors used by alphavirus during infection. These findings highlight the ability of zebrafish as a powerful *in vivo* model for studying host factor-virus interactions to reveal previously unknown or unseen phenotypes for further study.

THREE MINUTE FYP PRESENTATIONS

THREE MIN FYP 1

ESTABLISHING A VIRUS-INDUCED GENE SILENCING SYSTEM IN CAPSICUM

SIM Janelle Shi Min^a, TAN Jing Heng Javier^b, LIU Qian^b, YANG Rui^b, JIANG Dan Hua^b

^aDiploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651, ^bTemasek Life Sciences Laboratory, 1 Research Link, Singapore 11760

Capsicum is a nutritionally rich and economically important crop, consumed as both a spice and a vegetable due to its distinctive flavour, colour, and nutritional value. However, the regulatory mechanisms underlying key agronomic traits, such as fruit development and ripening, remain poorly understood, hindering further genetic improvement. In this study, we establish a virus-induced gene silencing (VIGS) system in Capsicum to enable functional genomic studies. By silencing Phytoene Desaturase (PDS), a key gene in the carotenoid biosynthesis pathway that produces a photobleaching phenotype when suppressed, we screened multiple cultivars for VIGS compatibility and identified two high-performing cultivars. VIGS was further applied to several candidate genes involved in fruit development and ripening, and RT-qPCR analysis confirmed effective silencing of most target genes. Among these genes, phenotypic analysis revealed delayed ripening in RIN- and NOR-silenced fruits. These results provide a robust platform for future functional studies in Capsicum.

THREE MIN FYP 2

EFFECTIVENESS OF CHITINOLYTIC BACTERIA FROM GUT OF JOHN'S SNAPPER (*LUTJANUS JOHNI*) ON REDUCING CHITIN CONTENT IN INSECT MEAL

JOACHIM Mejia Lexa^a, NG Shi En^a, TEO Yong Jian Glendon^a

^a*Temasek Polytechnic*

This study investigates the effectiveness of chitinolytic bacteria found in the gastrointestinal (GI) tract of John's Snapper (*Lutjanus johnii*) in reducing chitin content in insect meal. 30 John's Snapper fingerlings were fed a chitin-rich diet in an 8-week period to selectively increase the growth of chitinolytic bacteria in the gut microbiota. Bacteria was harvested from the intestines of 20 snappers and streaked onto chitinspecific agar plates. Six bacterial samples were species identified via Analytical Profile Index 20E (API20E). Four of the six bacteria samples were found to be species under the *Aeromonas* genus, known to exhibit chitinolytic activity. An experimental trial was conducted to assess the reduction in chitin content in insect meal across the four separate bacteria strains after 24 hours and 48 hours. Results indicated that all four bacteria strains were effective in reducing the chitin content in insect meal, with the average reduction in chitosan concentration at 24 hours being 86.7%. One-way Analysis of Variance (ANOVA) supported this by showing statistical significance. This indicates that these bacteria strains could potentially aid in chitin digestion for insect feeds to increase protein content in insect feeds. With further research on bacteria strain identification and purification, these strains could provide insect farmers with a sustainable biological method of processing their insect meals for chitin removal.

THREE MIN FYP 3

INVESTIGATING THE IMPACT OF A PERICONCEPTION NUTRITIONAL INTERVENTION ON CHILD BIOMARKERS OF OBESITY

LEE Jie Ting Jorene^{1,2}, Hannah Ee Juen YONG², TAN Shi-Xiong¹

¹*School of Applied Science, Republic Polytechnic, Singapore 738964,*

²*Institute for Human Development and Potential, Agency for Science, Technology and Research, Singapore 117609*

The Developmental Origins of Health and Disease (DOHaD) concept highlights how exposures during the early stages of life can affect long-term development and health outcomes, suggesting that the periconceptual environment may be crucial in laying the foundations for healthier offspring. Thus, optimising maternal health around the time of conception has been proposed as an approach to promote healthier offspring outcomes. A clinical trial had demonstrated that a nutritional intervention starting before pregnancy and continued through pregnancy reduced the incidence of obesity in infancy. Nevertheless, whether this effect persists into later childhood and the underlying mechanisms remain unclear. This study aimed to investigate the effects of this intervention on the children's body mass index (BMI), and whether two circulating biomarkers of obesity (factors A and B) were altered in mid-childhood. Offspring blood serum samples were tested using the enzyme-linked immunosorbent assay (ELISA) and results analysed with statistical tests like the Mann-Whitney U test, 2-way ANOVA, and Spearman's Correlation. Overall, the intervention associated with a lower BMI, a lower factor B level, and a higher factor A/factor B ratio, indicating an improved metabolic profile. There was no change in factor A levels. These findings highlight the potential for early periconceptual nutritional intervention to promote healthier long-term metabolic outcomes in the offspring. Further studies to examine other related outcomes and to determine how the intervention may work at the molecular level to influence offspring health will be key in developing novel early-life interventions aimed at improving health outcomes in children.

THREE MIN FYP 4

STATISTICAL ANALYSIS OF FACTORS INFLUENCING DISEASE OUTCOMES

LIM Xin Hui, LIM Jun Ming Denzil, Wayne FORDAY

^aNgee Ann Polytechnic

Type 2 Diabetes remains a major public health concern, with prevalence increasing significantly with age. Many population-based studies examining nutritional predictors rely on self-reported diabetes diagnosis results, which may introduce potential misclassification bias and obscuring differences between diagnosed and undiagnosed cases. This study aimed to identify sociodemographic, anthropometric, and dietary predictors of diabetes across the adult lifespan using laboratory-confirmed diagnostic criteria.

Data was obtained from six cycles of the National Health and Nutrition Examination Survey (NHANES) spanning 2007-2018. Diabetes status was defined using laboratory-measured glycated haemoglobin (HbA1c), with pre-diabetic individuals excluded to ensure phenotype specificity. Analyses were conducted among adults aged 20-80+ and stratified into three age groups (20-55, 55-65, and 65-80+). A combined inferential and predictive analytical framework was employed. Survey-weighted logistic regression was used to estimate population level associations through Average Marginal Effects, while XGBOOST models with SHAP (Shapley Additive Explanations) analysis were applied to capture non-linear relationships and improve predictive performance.

Across all age strata, anthropometric and sociodemographic variables-particularly waist circumference, age, race/ethnicity, and education-emerged as the strongest predictors of diabetes risk. Central adiposity consistently demonstrated greater predictive importance than body mass index. XGBOOST models achieved higher predictive accuracy than logistic regression, particularly among older adults. Although certain dietary fatty acids showed marginal associations within the 55-65 age group, their effects were secondary to structural risk factors. Descriptive analysis also suggested potential reverse causality in dietary reporting among diagnosed individuals.

Overall, these findings highlight the dominant role of central adiposity in diabetes risk and underscore the value of laboratory-confirmed measures and age-stratified machine learning approaches in epidemiological research.

THREE MIN FYP 5

FORCED DEGRADATION OF A BLOCK COPOLYMER TO GUIDE STABILITY CONSIDERATIONS IN POLYMERIC NANOPARTICLE FORMULATION DEVELOPMENT

Mervin WOON Jie En^{a,b}, Wei Xiang POH^b, Shaoqiong LIU^{b*}

^aSchool of Applied Chemistry, Nanyang Polytechnic, Singapore, ^bACM Biolabs, Singapore

ACM Biolabs utilizes an amphiphilic block copolymer (ABC) in its research and development of block copolymer nanoparticle (BNP) formulations for drug delivery applications. The stability of polymeric excipients is critical for the development of robust BNP formulations. In this study, ABC was subjected to controlled stress conditions, as recommended by International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) Q1A (R2) and Q1B guidelines, to evaluate its susceptibility to degradation. The extent of degradation was quantified using gel permeation chromatography (GPC), while the structures of the resulting degradation products were characterized by proton nuclear magnetic resonance spectroscopy. Stress studies indicate that the ABC is susceptible to thermal stress and photolytic exposure, and its degradation proceeds in a kinetically controlled manner. GPC chromatogram showed a front-shoulder peak under these conditions, indicating the formation of higher-molecular-weight species. This was attributed to radical generation, where radicals either react with oxygen to form peroxides and epoxide groups or recombine with radicals on neighboring chains, leading to crosslinking. To minimize the formation of oxidative and photolytic impurities, the ABC is stored at sub-ambient temperature, under an inert atmosphere, and protected from light, translating to the storage conditions for polymeric nanoparticle formulations.

THREE MIN FYP 6 DEVELOPMENT AND VALIDATION OF A HPTLC METHOD FOR CANNABINOID ANALYSIS ON THE CAMAG® HPTLC PRO.

Nathan CHAN^a, Sylvia TAN^b, Ying Ying TAN^b, Reenie CHIN^b, Mary LIM^b, Li Wen PHANG^b, Filbert ANG^a, LI Huan^a

^aTemasek Polytechnic, ^bHealth Sciences Authority

At the Health Sciences Authority (HSA) Illicit Drugs Laboratory, a significant portion of the analytical work done involves instrumental analysis. Most analytical techniques have associated instruments that are highly optimised, automated, and digitised. However, one analytical technique that remains manual is Thin Layer Chromatography (TLC), which is used as a complementary technique to Gas Chromatography-Mass Spectrometry (GC-MS) for the identification of cannabinoids. With the acquisition of the CAMAG® HPTLC PRO following preliminary studies in conjunction with the Temasek Polytechnic School of Applied Science, validation of the instrument's use for cannabinoid analysis is required before implementation into the analytical workflow. The main cannabinoids of interest were cannabiniol, cannabidiol, and delta-9-tetrahydrocannabinol. The method development involved the experimentation of various parameters such as different solvent systems to optimise separation of the cannabinoids and to determine a suitable spraying reagent. After optimisation, the method's selectivity, precision, limit of detection, carryover, and evaluation of matrix effects in street samples were validated. The successful development and validation of the HPTLC method for the identification of cannabinoids has enabled the Illicit Drugs Laboratory to automate its existing TLC workflow, delivering significant improvement in efficiency and result reproducibility.

THREE MIN FYP 7

RISK DETERMINANTS OF ILL-HEALTH

HELMI Nurul Huda, **FORDAY Wayne Lee**

Ngee Ann Polytechnic

Dementia and cognitive decline are increasing public health concerns in ageing populations. Cardiovascular health (CVH) has been identified as a modifiable factor that may influence cognitive ageing. Life's Essential 8 (LE8) is a composite measure of CVH that has been linked to cognitive outcomes, but its ability to predict cognitive impairment remains unclear.

A cross-sectional secondary analysis was conducted using National Health and Nutrition Examination Survey (NHANES) data from U.S. adults aged 60 years and older. CVH was measured using LE8 scores, analysed as both continuous and categorical variables. Cognitive function was assessed using CERAD, AFT, and DSST tests. Associations were examined using linear regression, multivariable logistic regression, and one-way ANOVA. Predictive performance was evaluated using ROC-AUC, accuracy, and confusion matrices.

Higher LE8 scores were associated with better continuous cognitive performance, particularly global cognition and processing speed. Significant differences in CERAD and DSST scores were observed across CVH groups. However, LE8 was not independently associated with binary cognitive impairment outcomes after full adjustment. Predictive models showed limited discriminative ability despite improved ROC-AUC.

These findings suggest that CVH is more strongly related to continuous cognitive performance than to clinically defined cognitive impairment, highlighting the multifactorial nature of dementia risk.

Overall, CVH is meaningfully associated with cognitive function at the population level but has limited value for predicting clinical cognitive impairment. LE8 remains useful for understanding cognitive ageing trends and promoting cardiovascular risk reduction.

Future studies should use longitudinal designs and multimodal approaches to improve causal relationships assessment and dementia risk prediction.

THREE MIN FYP 8

SEX DIFFERENCES IN MUSCLE FIBRE DISTRIBUTIONS AND SARCOPENIC MEMBRANE DAMAGE

Parashu Raam SUBRAMANIAN^a, WON Choong Yun^a, Dr TSAI Shih-Yin^b

^a*School of Applied Science (SAS), Republic Polytechnic, Singapore,*

^b*Department of Physiology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore*

Sarcopenia, an age-related decline in muscle mass and function, presents a major concern for aging populations. Protein homeostasis is crucial for maintaining muscle health by balancing protein synthesis and degradation, regulated by mTOR and autophagy pathways. *S6k1*, *Atg7* and *4ebp1* modulate these pathways and play a pivotal role in sarcopenia's progression. Impaired autophagy in *Atg7mKO* and reduction of protein synthesis in *S6k1mKO* mice models result in early-onset myopathy. Hyperactivation of *4ebp1*, a downstream inhibitor of cap-dependent translation, can notably restore muscle integrity in *Atg7mKO* mice by enhancing proteasome activity. However, the sex-specific effects of *4ebp1* activation and *S6k1mKO* on muscle fibre atrophy remain unexplored.

This study aims to derive sex-based disparities in atrophy mechanisms of muscle fibre types with regards to *Atg7mKO*, *4ebp1mt-Atg7mKO* and *S6k1mKO*.

MyHC staining was applied to assess atrophy in fibre types. Results revealed that *Atg7* deletion resulted in both sexes exhibiting muscle atrophy most significant in glycolytic fibres. Overexpression of *4ebp1* rescues this with males exhibiting a hypertrophic effect across all fibre types, not females. Deletion of *S6k1* in aging females displayed no disparity as compared to control aging females while in *S6k1mKO* aging males, type IIb fibres were protected from atrophy.

IgG staining was used to evaluate membrane damage, revealing that sarcopenic membrane damage is more pronounced in aged females as compared to males. These findings underscore sex-based variances in muscle atrophy, implying that *4ebp1* activation offers potential therapeutic benefits for muscle atrophy disorders by targeting distinct muscle preservation mechanisms.

THREE MIN FYP 9

Capturing GPCR Signalling in Action: Engineering a Cryo-EM Stabilisation Platform for Drug Target Studies

TAN Yan Wei Justin^a, NIU Mu Yuan^b, SHEN Xuan^b, TAN Yong Zi^b

^a*Diploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651*

^b*Department of Biological Sciences, National University of Singapore, Block S1A, Lee Wee Kheng Building, Level 5 Right Wing # 05-19, 14 Science Drive 4 Singapore 117543*

G-protein coupled receptors (GPCRs) are central mediators of neuron signalling and represent major therapeutic targets in neurodegenerative disorders including Alzheimer's and Parkinsons diseases. High-resolution structural characterization of GPCRs by cryogenic electron microscopy (Cryo-EM) critically depends on homogeneous, conformationally stable protein complexes. This study establishes an optimized end-to-end structural biology workflow to enhance membrane scaffold protein MSP1D1 overexpression and large-scale Nb35 nanobody production for GPCR Cryo-EM application. Systematic host screening identified *E. coli* Acella (DE3) as a superior expression strain compared to its parental BL21 (DE3), enabling improved recombinant protein yield and stability. Nb35 was purified through immobilized metal affinity chromatography (IMAC) followed by size-exclusion chromatography, producing highly pure and monodisperse nanobody preparations. The optimized protocol yielded 1.42 mg/mL in a final 600 μ L volume from a pooled 6L culture. These optimised stabilizing components enabled successful assembly of MSP1D1-based nanodiscs and GPCRs-Nb35 complexes for empirical cryo-EM analysis. Collectively, this work demonstrates that data-driven optimization significantly enhances reproducibility and structural readiness in GPCR workflows, contributing to higher-resolution structural elucidation and future structure-guided drug discovery.

THREE MIN FYP 10

STIMULI-ACTIVATED SOFT ACTUATOR VIA IONIC ASSEMBLY OF SHEAR-ALIGNED CHITOSAN

Yuki Sum Yong LEE^{1,2}, Sirawit PRUKSAWAN² and FuKe WANG²

¹*Nanyang Polytechnic, 180 Ang Mo Kio Avenue 8, Singapore, 569830, Republic of Singapore*

²*Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology, and Research (A*STAR), 2 Fusionopolis Way, Innovis #08-03, Singapore 138634, Republic of Singapore*

A stimuli-responsive hydrogel actuator was produced by shear aligning chitosan in a poly(acrylic acid) matrix. It exhibits reversible anisotropic mechanics and perpendicular shape morphing. In the pristine state, the hydrogel demonstrates isotropic properties and a low mechanical stiffness, rendering it unsuitable for load-bearing applications. However, upon treatment with multivalent cations (eg. Ca^{2+}), the pre-aligned chitosan chains were assembled into multilevelly aligned domains triggered by reversible ionic bridging. This reinforces the hydrogel and activates its anisotropic mechanical behaviour, bringing about an increase of as much as 60 times in tensile strength and distinct anisotropic stiffness, exhibiting greater strength perpendicular to the alignment axis than along it, thereby restricting deformation along the aligned direction and driving controlled bending and morphing perpendicular to the alignment. Morphological analyses revealed alignment-preserved densification and anisotropic shrinkage upon activation, validating the mechanically driven actuation mechanism. This hydrogel system separates alignment from permanent structure, enabling reversible, stimulus-controlled mechanical anisotropy and customisable actuation without permanent fillers or multilayer systems. This hydrogel offers a scalable platform for emerging biomimetic actuators, with potential applications in soft robotics and artificial muscles.

POSTER PRESENTATIONS

P1

EFFECTIVENESS OF CHITINOLYTIC BACTERIA FROM GUT OF JOHN'S SNAPPER (*LUTJANUS JOHNI*) ON REDUCING CHITIN CONTENT IN INSECT MEAL

JOACHIM Mejia Lexa^a, NG Shi En^a, TEO Yong Jian Glendon^a

^a*Temasek Polytechnic*

This study investigates the effectiveness of chitinolytic bacteria found in the gastrointestinal (GI) tract of John's Snapper (*Lutjanus johnii*) in reducing chitin content in insect meal. 30 John's Snapper fingerlings were fed a chitin-rich diet in an 8-week period to selectively increase the growth of chitinolytic bacteria in the gut microbiota. Bacteria was harvested from the intestines of 20 snappers and streaked onto chitinspecific agar plates. Six bacterial samples were species identified via Analytical Profile Index 20E (API20E). Four of the six bacteria samples were found to be species under the *Aeromonas* genus, known to exhibit chitinolytic activity. An experimental trial was conducted to assess the reduction in chitin content in insect meal across the four separate bacteria strains after 24 hours and 48 hours. Results indicated that all four bacteria strains were effective in reducing the chitin content in insect meal, with the average reduction in chitosan concentration at 24 hours being 86.7%. One-way Analysis of Variance (ANOVA) supported this by showing statistical significance. This indicates that these bacteria strains could potentially aid in chitin digestion for insect feeds to increase protein content in insect feeds. With further research on bacteria strain identification and purification, these strains could provide insect farmers with a sustainable biological method of processing their insect meals for chitin removal.

P2

Plasma bio-engineered hybrid solid-hydrogel dressing for wound healing

Jun Tong GOH^a, Priscilla LIM Lay Keng^b, Declan LUNNY^{b,c}, Masoud ZHIANMANESH^d, Kenneth LAY Wei Jian^b, Behnam AKHAVAN^d, Carine BONNARD^{b,c}

^a*Diploma in Biomedical Sciences, School of Chemical and Life Sciences, Singapore Polytechnic, Singapore,* ^b*Model Development, A*STAR Skin Research Labs (SRL), Agency for Science, Technology and Research (A*STAR), Singapore,* ^c*Asian Skin Biobank, Skin Research Institute of Singapore (SRIS), A*STAR, Singapore,* ^d*School of Engineering, The University of Newcastle, Callaghan, Australia*

Effective wound repair is essential for preventing infections and reducing the risk of severe complications, including delayed healing and mortality. While conventional hydrogel bandages offer advantages over traditional wound dressings, they often lack sufficient mechanical integrity and stability, and face limitations in synthesis, processing, and production. To address these challenges, our collaborators at the University of Newcastle developed a plasma bio-engineered hybrid solid-hydrogel wound dressing designed to enhance wound repair efficiency.

This advanced dressing system is fabricated using a cold, atmospheric-pressure plasma pen to functionalise transparent, flexible polymeric samples, thereby enabling the covalent attachment of a drug-loaded hydrogel layer. Here, the plasma-treated polycaprolactone (PCL) solid backing demonstrated biocompatibility when evaluated using a 3D De-epidermised Dermis Human Skin Equivalent (DED-HSE) wound model, in which it also promoted wound closure. Furthermore, a gelatin methacrylate (GelMA) hydrogel rehydrated with Dulbecco's Modified Eagle Medium (DMEM) supported enhanced re-epithelialisation in an *in vitro* wound setting.

Overall, this hybrid solid-hydrogel wound dressing technology demonstrates significant potential to improve wound healing by integrating structural support, biocompatibility and controlled delivery of anti-infection therapeutics. These dressings may offer a promising and versatile platform for next-generation wound treatment *in situ*.

P3

STIMULI-ACTIVATED SOFT ACTUATOR VIA IONIC ASSEMBLY OF SHEAR-ALIGNED CHITOSAN

Yuki Sum Yong LEE^{1,2}, Sirawit PRUKSAWAN² and FuKe WANG²

¹Nanyang Polytechnic, 180 Ang Mo Kio Avenue 8, Singapore, 569830, Republic of Singapore

*²Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology, and Research (A*STAR), 2 Fusionopolis Way, Innovis #08-03, Singapore 138634, Republic of Singapore*

A stimuli-responsive hydrogel actuator was produced by shear aligning chitosan in a poly(acrylic acid) matrix. It exhibits reversible anisotropic mechanics and perpendicular shape morphing. In the pristine state, the hydrogel demonstrates isotropic properties and a low mechanical stiffness, rendering it unsuitable for load-bearing applications. However, upon treatment with multivalent cations (eg. Ca^{2+}), the pre-aligned chitosan chains were assembled into multilevelly aligned domains triggered by reversible ionic bridging. This reinforces the hydrogel and activates its anisotropic mechanical behaviour, bringing about an increase of as much as 60 times in tensile strength and distinct anisotropic stiffness, exhibiting greater strength perpendicular to the alignment axis than along it, thereby restricting deformation along the aligned direction and driving controlled bending and morphing perpendicular to the alignment. Morphological analyses revealed alignment-preserved densification and anisotropic shrinkage upon activation, validating the mechanically driven actuation mechanism. This hydrogel system separates alignment from permanent structure, enabling reversible, stimulus-controlled mechanical anisotropy and customisable actuation without permanent fillers or multilayer systems. This hydrogel offers a scalable platform for emerging biomimetic actuators, with potential applications in soft robotics and artificial muscles.

P4

COMPARATIVE STUDY BETWEEN 3D PRINTED FENOFIBRATE TABLETS AND COMPRESSION-BASED FENOFIBRATE TABLETS MADE FROM A SINGLE PUNCH TABLET PRESS

Elise LIM Wen Hui^a, Kayli Safiah BRUNSON^a, KO Yu Xuan^a, NG Si Qi Denise^a, XIE Yiming^a, Josefina SEOW^a

^aRepublic Polytechnic

This study aimed to compare the quality control characteristics of immediate-release Fenofibrate tablets produced using two different manufacturing approaches: Three-dimensional (3D) printing and compression via a single-punch pellet press. A proprietary formulation of Fenofibrate and excipients provided by Craft Health was employed for both methods. Pellet-pressed tablets were produced through direct compression of the powder formulation, while three-dimensional printed tablets required paste optimisation to achieve suitable viscosity, extrudability, and structural stability for printing. Both tablet types were evaluated according to United States Pharmacopoeia (USP) guidelines using standard quality control tests, including weight variation, friability, hardness, disintegration, and dissolution. Dissolution testing was conducted using ultraviolet spectrophotometry to evaluate the percentage of drug released into the solution. Results showed that tablets from both manufacturing methods passed weight variation, friability, and disintegration requirements. However, the three-dimensional printed tablets demonstrated superior dissolution performance, releasing more than seventy-five per cent of Fenofibrate and meeting pharmacopoeia standards, while the pellet-pressed tablets failed to meet the dissolution threshold, potentially due to their denser and less porous structure, which impeded effective medium penetration and drug release. Overall, these findings suggest that the manufacturing method significantly influences tablet performance. Three-dimensional printing shows promise as an alternative pharmaceutical manufacturing approach, particularly for improving dissolution characteristics of poorly water-soluble drugs such as Fenofibrate.

Keywords: Fenofibrate tablets; three-dimensional printing; paste optimisation; weight variation; friability; hardness; disintegration; dissolution; quality control tests; ultraviolet spectrophotometry

P5

ASSESSMENT OF MACRONUTRIENT INTAKE USING 24-HOUR DIETARY RECALL DATA & EVALUATION AGAINST THE ACCEPTABLE MACRONUTRIENT DISTRIBUTION RANGES

MUHAMMAD Irfan Bin Jamalludin^a, Irene WANG Min Xin^a, Ethel CHEE Yan Lin^a, Dr Theresia Handayani MINA^b, Dr Antara CHAKRABORTY^a

^aRepublic Polytechnic, ^bNanyang Technological University Lee Kong Chian School of Medicine

This study evaluated macronutrient intake distribution using 24-hour dietary recall data and assessed adherence to the Acceptable Macronutrient Distribution Ranges (AMDR) among 170 adult participants in Singapore. We determined the percentage contribution of protein, carbohydrates, and fat to total energy intake, and results were benchmarked against AMDR recommendations and national dietary reference values. The relationship between macronutrient adherence and body mass index (BMI) categories was examined. Mean [SD] energy contributions were 46.6 [14.4] % for carbohydrates, 34.6 [11.1] % for fat, and 18.8 [9.6] % for protein. Self-reported protein intake showed the highest adherence, with over 80% of participants meeting AMDR recommendations. In contrast, fat intake exceeded recommended limits, while carbohydrate intake fell below the recommended range. The BMI distribution patterns (mean [SD]=24.8 [5.3] Kg/m²) were consistent with national trends, with a higher prevalence of overweight and obesity among males. No significant associations were observed between AMDR adherence and BMI classification ($p > 0.05$). The 24-hour dietary recall and AMDR benchmarking provided information regarding dietary composition and support further assessments in future eating behavioural studies.

P6

EVALUATION OF THE PROTEGO NOODLES FOR PREBIOTIC POTENTIAL

TAN Yu Wei Menfred^{a,b}, CHOO Mei Shan Charlotte^a, LEONG Florence^b, HENG Kiang Soon^a, HON Sook Mei^a

^a*Republic Polytechnic*, ^b*Kosmodehealth*

ProTEGO™ noodles are a plant-based functional noodle formulation designed to be high in protein and dietary fibre, providing a source of protein while supporting gut health. The formulation contains reduced net carbohydrate content and is positioned as a low glycaemic index (GI) functional staple, aligning with increasing demand for nutritionally improved and sustainable food products. This study evaluated the consumer acceptability of ProTEGO noodles and their potential influence on selected microorganisms following simulated gastrointestinal digestion.

Sensory evaluation assessed key quality attributes including appearance, aroma, texture, flavour, and overall acceptability to determine whether the functional formulation maintained desirable sensory characteristics. To examine physiological relevance, ProTEGO samples were subjected to *in vitro* gastrointestinal digestion based on the INFOGEST 2.0 protocol under controlled pH and temperature conditions. Carbohydrate breakdown during digestion was qualitatively assessed using Benedict's test to detect reducing sugars as an indicator of substrate bioaccessibility. Both digested and undigested samples were subsequently used in microbial growth assays.

Microbial responses were evaluated using plate count analysis against one probiotic strain, *Lactobacillus paracasei*, and two pathogenic indicator strains, *Escherichia coli* and *Salmonella enterica*, with inulin included as a prebiotic control. Digested ProTEGO supported increased growth of *L. paracasei*, while pathogenic strains were less favoured. These findings suggest that ProTEGO may exhibit selective prebiotic-like effects and has potential as a sustainable functional food to promote gut health.

P7

DEVELOPMENT AND VALIDATION OF A HPTLC METHOD FOR CANNABINOID ANALYSIS ON THE CAMAG® HPTLC PRO.

Nathan CHAN^a, Sylvia TAN^b, Ying Ying TAN^b, Reenie CHIN^b, Mary LIM^b, Li Wen PHANG^b, Filbert ANG^a, LI Huan^a

^aTemasek Polytechnic, ^bHealth Sciences Authority

At the Health Sciences Authority (HSA) Illicit Drugs Laboratory, a significant portion of the analytical work done involves instrumental analysis. Most analytical techniques have associated instruments that are highly optimised, automated, and digitised. However, one analytical technique that remains manual is Thin Layer Chromatography (TLC), which is used as a complementary technique to Gas Chromatography-Mass Spectrometry (GC-MS) for the identification of cannabinoids. With the acquisition of the CAMAG® HPTLC PRO following preliminary studies in conjunction with the Temasek Polytechnic School of Applied Science, validation of the instrument's use for cannabinoid analysis is required before implementation into the analytical workflow. The main cannabinoids of interest were cannabiniol, cannabidiol, and delta-9-tetrahydrocannabinol. The method development involved the experimentation of various parameters such as different solvent systems to optimise separation of the cannabinoids and to determine a suitable spraying reagent. After optimisation, the method's selectivity, precision, limit of detection, carryover, and evaluation of matrix effects in street samples were validated. The successful development and validation of the HPTLC method for the identification of cannabinoids has enabled the Illicit Drugs Laboratory to automate its existing TLC workflow, delivering significant improvement in efficiency and result reproducibility.

P8

TOWARDS SUSTAINABLE LAB PRACTICES: EXAMINING STERILIZATION METHODS FOR MICROPIPETTE TIP REUSE

CHNG Rui Ting, CHOKKA Swetha Pranuthi, Navya Shree VENKAT, TOH Jin Yuan

SUPERVISOR: Siti Hamimah HAMID; CO SUPERVISOR: Cherry CHAN

Republic Polytechnic

Single-use plastic consumables, particularly micropipette tips, contribute significantly to laboratory waste and associated environmental burdens. Teaching laboratories generate large volumes of contaminated plastic waste due to routine microbiological and molecular biology activities, highlighting the need for practical and sustainable reuse strategies. This study aimed to develop and evaluate a low-cost, time-efficient sterilisation protocol for the safe reuse of micropipette tips in Republic Polytechnic teaching laboratories.

Micropipette tips (100 μ L and 1000 μ L) were spiked with *Escherichia coli* or collected from routine laboratory use and subjected to detergent washing. Ultraviolet (UV) sterilisation at different exposure durations and configurations was also assessed. Decontamination effectiveness was evaluated by recovering residual bacteria, followed by serial dilution, spread plating, and colony-forming unit (CFU) enumeration.

Detergent washing at a 1:5 dilution effectively reduced *E. coli* contamination on both spiked and collected pipette tips to below detectable levels. In contrast, UV sterilisation alone produced inconsistent and incomplete reductions in viable bacteria, particularly when tips were treated within enclosed UV boxes. These findings indicate that detergent washing provides a reliable and practical decontamination approach, whereas UV treatment is insufficient as a standalone method.

Overall, this study demonstrates that a simplified detergent-based protocol can enable safe micropipette tip reuse for low-risk teaching laboratory applications, supporting waste reduction and sustainability initiatives without compromising biosafety.

Keywords: laboratory sustainability; pipette tip reuse; detergent washing; ultraviolet sterilisation; *Escherichia coli*.

P9

STUDYING EPIDEMIOLOGY OF BONE HEALTH IN ASIANS USING MUSCULOSKELETAL IMAGING (PQCT SCANNER)

Dr. MYA Thway Tint^a, ONYEKABA Regina^b, Wynn TEO Yi Rou^b, Naili Malisa Binti ABDUL RAHMAN RAIS CHONG^b, Danielle Ashleigh ROSETE ASHRAF^b, Thanya D/O MAGENDRAN^b, and Joe TAY^b

^aA*STAR Institute for Human Development and Potential, Growing Up in Singapore Towards healthy Outcomes (GUSTO), ^bRepublic Polytechnic School of Applied Science

This study characterizes distal radius bone health in a Singaporean female cohort using peripheral quantitative computed tomography (pQCT), aimed to explore age-related differences in cortical and trabecular microarchitecture and establish early population-specific reference patterns for Asian skeletal health.

A total of 67 participants aged 13–92 years were assessed using the Stratec XCT-3000 scanner. pQCT-derived metrics—including trabecular bone mineral density (BMD), cortical BMD, net fracture load, and strength–strain index (SSI)—were examined using scatterplots and linear regression models.

Across all parameters, regression analyses revealed negligible associations with age, reflected by the extremely low R^2 values (trabecular BMD $R^2 \approx 6 \times 10^{-5}$; cortical BMD $R^2 = 0.0033$; fracture load $R^2 = 0.0151$; SSI $R^2 \approx 1 \times 10^{-5}$). These minimal age trends suggest substantial inter-individual heterogeneity within this sample, likely influenced by Singapore's diverse ethnic, hormonal, lifestyle, and genetic profiles.

The absence of clear age-related declines highlights the limitations inherent to this early-phase, cross-sectional dataset, including modest sample size and uneven representation across age strata.

Nevertheless, this work provides the first pQCT-based baseline of distal-radius bone characteristics in Singaporean women, offering valuable groundwork for future normative modelling. The study forms the initial stage of a longitudinal programme that will enable intra-individual tracking of bone loss, refinement of population-specific reference intervals, and improved fracture-risk assessment in Asian populations. Larger, multi-ethnic cohorts and repeated follow-up scans will be essential for establishing robust local standards and advancing the feasibility of pQCT-informed osteoporosis

prevention strategies.

Keywords: pQCT; bone microarchitecture; cortical density; trabecular density; osteoporosis; Asian population; epidemiology.

P10

INVESTIGATING THE NEUROTOXICITY OF MUTANT TAU USING A DROSOPHILA MODEL OF ALZHEIMER'S DISEASE

Kubendiran Savita Sri^a, Ong Chin Tong^b

^a*Diploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651*

^b*Ong Ching Tong Laboratory, Temasek LifeSciences Laboratory, 1 Research Link, Singapore 117604*

Alzheimer's disease (AD), the leading cause of dementia worldwide is characterised by progressive neurodegeneration strongly associated with pathological alterations of the Tau protein. In healthy neurons, Tau stabilises microtubules and supports axonal transport. However in AD, Tau undergoes abnormal modifications that promotes aggregation and neurotoxicity. Recent studies have identified a truncated Tau isoform, referred to as Mutant Tau, generated through intron retention. This isoform is enriched in AD brain tissue and displays biochemical features linked to disease pathology, including altered stability and aggregation propensity. Despite these observations, its functional contribution to neurodegeneration remains unclear.

In this study, a *Drosophila melanogaster* model was employed to investigate whether neuronal expression of Mutant Tau results in increased mortality.

Transgenic flies expressing either Full-Length *Tau* or Mutant *Tau* were subjected to desiccation and oxidative stress assays to evaluate acute stress sensitivity, as well as longitudinal ageing assays to assess lifespan effects. Western blot analysis confirmed that both genotypes expressed *Tau* at comparable levels, ensuring that any phenotypic differences would not be attributable to unequal protein expression.

Across all experimental conditions, no significant differences in survival were observed between flies expressing Full-Length *Tau* and those expressing Mutant *Tau*. Neither acute environmental stress nor normal ageing led to increased mortality in the Mutant *Tau* group. These findings suggest that Mutant *Tau* does not induce overt toxicity or reduce lifespan in *Drosophila*. Instead, Mutant *Tau*-associated pathology may involve subtle, long-term neuronal dysfunction that is not detectable through whole-organism survival assays alone.

P11

OPTIMISING SERUM-FREE MEDIA FORMULATION FOR CULTIVATED MEAT APPLICATION

GOH Kai Jun Benedict^a, LEUNG Chak Ming^b

^aTemasek Polytechnic School of Applied Science Medical Biotechnology,

^bMeatiply Pte Ltd

The development of a scalable and animal-free cell culture media is essential for the advancement of cultivated meat. Two major bottlenecks in cultivated culture media arise from over-reliance of bovine serum albumin (BSA) as a media supplement, and concerns over toxic ammonia build up due to glutamine metabolism. Hence, this study aims to overcome the bottlenecks in cultivated culture media by (i) Investigating the essentiality of glutamine and glutamine alternatives supplementation, and (ii) Assess Cyclodextrin (CD) as a potential animal free alternative to BSA. Focusing on chicken adipocytes, we assessed cell proliferation and morphology through both short and long-term assays across multiple passages. The results demonstrated that glutamine and glutamine alternative supplementation are non-essential for short-term cell culture as they have minimal influence on early-stage growth and morphology. Additionally, assessments on CD indicate promising potential as the cells were able to sustain proliferation over several passages when cultured in BSA-free cultivated culture media. Collectively, this research contributes towards achieving an animal-free and scalable cultivated meat media by highlighting the possibility of omitting glutamine supplementation and simplifying media formulations while establishing the adoption of CD as an animal-free albumin alternative. Future work should evaluate the long-term essentiality of glutamine and further optimise CD to improve support for cell proliferation possibly through synergistic interactions with other complementary supplements.

P12

**OVEREXPRESSION OF BLOWFLY (*Lucilia sericata*)
ANTIMICROBIAL PEPTIDES (AMPs) USING AGRO-
TRANSIENT EXPRESSION STRATEGY AND EVALUATION
OF THEIR EXPRESSION IN PLANTS**

Jayden TAN Xun Zhi^a, Blandon TAN You Liang^a, KOH Zi Yi^a, A. Sai Gughan^a, FONG Siew Lee^b, TEO Shuan Hao^b, Kenny WONG Siew Cheong^a, and WU Hui-Wen^a

^a*School of Applied Science, Republic Polytechnic*; ^b*Agriculture Research and Innovation Centre, Republic Polytechnic*

Bacterial plant diseases threaten crop productivity and motivate alternative antimicrobials beyond conventional chemical control. Insect-derived antimicrobial peptides (AMPs) are promising candidates for disease control; however, their small size and susceptibility to degradation often limit their accumulation and detectability in plant-based expression systems. Plant transient expression offers a rapid and non-GMO production platform, making it attractive for early-stage screening of bioactive peptides.

In this study, we assessed the feasibility of producing *Lucilia sericata* AMP constructs in plants using *Agrobacterium tumefaciens*-mediated transient expression. Expression vectors encoding two AMP candidates (AMP2 and AMP4) were assembled using Gateway[®] recombination in GFP-, YFP-, or HA-tagged formats, including variants with an elastin-like polypeptide (ELP) carrier. To improve expression, constructs were evaluated with and without protein expression enhancers. Verified constructs were introduced into *A. tumefaciens* and syringe-infiltrated into hydroponically grown *Nicotiana benthamiana* and a fast-growing plant species. Leaf tissue was analysed by Western blotting to assess recombinant protein production.

P13

CHARACTERISATION OF *WOLBACHIA*-INFECTED *Aedes Aegypti*

SIM Xuan Hui Megan^a, NG Sui Hann^b, CAI Yu^b

^a*Singapore Polytechnic*, ^b*Temasek Life Sciences Laboratory*

Aedes aegypti, the primary vector for dengue in Singapore, remains a public health concern in Singapore. As part of Project *Wolbachia*, in 2016, Singapore introduced the Incompatible Insect Technique (IIT) using *Wolbachia*-infected male mosquitoes, which is key for population suppression. This study evaluates the fitness of *A. aegypti* infected with different *Wolbachia* strains through the study of their fecundity and fertility, their ability to induce cytoplasmic incompatibility (CI), and their rate of maternal transmission. PCR confirmed 100% maternal transmission in all strains. Strains B, C, and D reduced egg production, with strain D showing the highest fitness cost. Fertility was reduced in strains A, B, and D, while strain C had minimal impact. Complete CI was induced in all crosses, supporting its role in population suppression. These results help evaluate the suitability of *Wolbachia* strains for long term IIT-based control in Singapore.

P14

ESTABLISHING A VIRUS-INDUCED GENE SILENCING SYSTEM IN CAPSICUM

SIM Janelle Shi Min^a, TAN Jing Heng Javier^b, LIU Qian^b, YANG Rui^b, JIANG Dan Hua^b

^aDiploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651, ^bTemasek Life Sciences Laboratory, 1 Research Link, Singapore 11760

Capsicum is a nutritionally rich and economically important crop, consumed as both a spice and a vegetable due to its distinctive flavour, colour, and nutritional value. However, the regulatory mechanisms underlying key agronomic traits, such as fruit development and ripening, remain poorly understood, hindering further genetic improvement. In this study, we establish a virus-induced gene silencing (VIGS) system in Capsicum to enable functional genomic studies. By silencing Phytoene Desaturase (PDS), a key gene in the carotenoid biosynthesis pathway that produces a photobleaching phenotype when suppressed, we screened multiple cultivars for VIGS compatibility and identified two high-performing cultivars. VIGS was further applied to several candidate genes involved in fruit development and ripening, and RT-qPCR analysis confirmed effective silencing of most target genes. Among these genes, phenotypic analysis revealed delayed ripening in RIN- and NOR-silenced fruits. These results provide a robust platform for future functional studies in Capsicum.

P15

FORCED DEGRADATION OF A BLOCK COPOLYMER TO GUIDE STABILITY CONSIDERATIONS IN POLYMERIC NANOPARTICLE FORMULATION DEVELOPMENT

Mervin WOON Jie En^{a,b}, Wei Xiang POH^b, Shaoqiong LIU^{b*}

^aSchool of Applied Chemistry, Nanyang Polytechnic, Singapore, ^bACM Biolabs, Singapore

ACM Biolabs utilizes an amphiphilic block copolymer (ABC) in its research and development of block copolymer nanoparticle (BNP) formulations for drug delivery applications. The stability of polymeric excipients is critical for the development of robust BNP formulations. In this study, ABC was subjected to controlled stress conditions, as recommended by International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) Q1A (R2) and Q1B guidelines, to evaluate its susceptibility to degradation. The extent of degradation was quantified using gel permeation chromatography (GPC), while the structures of the resulting degradation products were characterized by proton nuclear magnetic resonance spectroscopy. Stress studies indicate that the ABC is susceptible to thermal stress and photolytic exposure, and its degradation proceeds in a kinetically controlled manner. GPC chromatogram showed a front-shoulder peak under these conditions, indicating the formation of higher-molecular-weight species. This was attributed to radical generation, where radicals either react with oxygen to form peroxides and epoxide groups or recombine with radicals on neighboring chains, leading to crosslinking. To minimize the formation of oxidative and photolytic impurities, the ABC is stored at sub-ambient temperature, under an inert atmosphere, and protected from light, translating to the storage conditions for polymeric nanoparticle formulations.

P16

EXPLORING THE USE OF MACSIMA PLATFORM IN COMPLEMENTING CONVENTIONAL IMMUNOHISTOCHEMISTRY (IHC) DIAGNOSTIC METHODS

**Zonell LIM EnQi^a, YU Jia^b, Afifah Binte MUSTAFFA^b, Edwin CHEW^b,
GOH Jian Yuan^b, AW Sze Jet^b and Kenneth CHANG^b**

^aDiploma in Medical Biotechnology, School of Applied Science, Temasek Polytechnic

^bDepartment of Pathology and Laboratory Medicine, KK Women's and Children's Hospital

Traditional immunohistochemistry (IHC) detects only a single biomarker per tissue section, which can exhaust limited tissue samples and prevents the assessment of protein co-expression. The MACSima platform was developed to address this limitation as an automated high-plex imaging system that enables high-resolution, single-cell spatial analysis and simultaneous detection of multiple proteins on a single tissue section. This study aimed to validate the Miltenyi Biotec MACSima cyclic imaging platform for diagnosing paediatric brain tumours, specifically diffuse midline glioma (DMG), where limited tissue volume risks tissue exhaustion. A panel of 13 biomarkers (H3K27M, H3K27me3, GFAP, etc.) representing a general brain tumour panel was used. For validation, one representative DMG sample was analysed using both MACSima and conventional IHC to assess concordance of staining patterns within specific subcellular compartments, such as nuclear H3K27M. The validation sample demonstrated concordant staining patterns between both platforms, supporting the reliability of the MACSima system. The remaining eight DMG samples (total n = 9) were analysed using MACSima alone and showed staining patterns consistent with the validated case. Although some variability in data quality and technical artefacts was observed, including occasional non-specific cytoplasmic or aberrant nuclear staining for certain proteins (e.g., Olig2 and MUC1), diagnostic results were obtained for most samples. Further studies with larger cohorts and optimised antibody panels are recommended. Overall, the MACSima imaging platform represents a promising approach for multiplex biomarker analysis in DMG, enabling visualisation of protein co-expression while preserving limited tissue samples.

P17

NON-INVASIVE ENVIRONMENTAL MONITORING OF VIBRIO ALGINOLYTICUS INFECTION IN SHRIMP AQUACULTURE PRODUCTION SYSTEMS

**LIM Xin Mei^a, NG Wan Jie^a, IMAN Yasmin Binte Zulhairi^a,
PADMANABHAN Saravanan^b**

^a*Diploma in Veterinary Technology*, ^b*Aquaculture Innovation Centre (AIC),
School of Applied Science, Temasek Polytechnic*

White leg shrimp (*Litopenaeus vannamei*) is a commercially important species widely farmed in ASEAN countries and in Ecuador. *Vibrio alginolyticus* is one of the major pathogens that affects cultured *L.vannamei* shrimps, resulting in 70 – 100% mortalities that significantly impact the economy.

Outbreaks are managed with strict pond hygiene, probiotics, and in some cases, with oxolinic acid/oxytetracycline antibiotic treatment, though antibiotic resistance (AMR) is emerging.

Lab-based diagnostic techniques take a long time to queue for analysis, are dependent on sophisticated instruments, and require technical expertise. Early on-site diagnosis of *Vibrio* infection is thus imperative to prevent and control outbreak situations and manage economic losses.

In the present project study, an on-site sample preparation methodology integrated with a DNA-based colorimetric loop-mediated isothermal amplification (C-LAMP) assay for the detection of *Vibrio alginolyticus* from the shrimp culture environment was successfully developed. The overall test accuracy in spiked seawater samples was determined to be 92.9%, with a limit of detection (LOD) of 5 picogram DNA/mL of sample. The developed on-site assay could serve as an excellent screening tool with a user-friendly, lab-independent, non-invasive, sensitive detection of *Vibrio* infections in aquaculture water samples.

P18

OPTIMIZATION AND VALIDATION OF A HIGH-THROUGHPUT SCREENING ASSAY TO IDENTIFY SMALL-MOLECULE INHIBITORS AGAINST DRUG-TOLERANT PERSISTENT (DTP) CELLS IN LUNG CANCER

Brice LEE^a & Doris TEE^b

^aTemasek Polytechnic, ^bExperimental Drug Development Centre (EDDC)

Over the past 20 years, lung cancer treatment has advanced significantly with the development of targeted therapies. These drugs target specific cancer-driving mutations, such as abnormalities in the Epidermal Growth Factor Receptor (EGFR). EGFR-Tyrosine kinase inhibitors (EGFR-TKIs) represent a major class of targeted therapies, of which, the small-molecule drug Osimertinib (OSI) is commonly employed as first-line treatment for EGFR-positive advanced NSCLC. While OSI treatment improves overall survival, the majority of patients ultimately develop drug resistance within 9 to 15 months, resulting in disease recurrence.

Recently, in July 2025, the National Cancer Centre Singapore (NCCS) partnered with the Agency for Science, Technology and Research (A*STAR) and the National University Cancer Institute, Singapore (NCIS) to launch “DEBUT: Discovering novel Biomarkers and Unveiling Therapeutic Vulnerabilities in Drug-tolerant Persistent (DTP) cells,” a project aimed at overcoming drug resistance by targeting DTP cells and improving long-term therapeutic outcomes.

In alignment with the DEBUT project, this study aimed to optimize and validate a 384-well cell viability assay for high-throughput screening of DTP cells in NSCLC to identify potential therapeutic “hits,” either as single agents or in combination with existing treatments. Assay parameters including signal stability, DMSO tolerance, and assay robustness, were systematically optimized to ensure sensitive and reproducible data generation. The optimized assay was validated through pilot screening using a Pharmacopoeia Library and will subsequently support large-scale screening in later stages of the DEBUT project to enable hit identification as chemical starting points for subsequent hit-to-lead optimization and drug development.

P19

SCREENING AND EVALUATING INSECT-DERIVED COMPOUNDS AGAINST FUNGAL PATHOGEN (*Fusarium oxysporum*)

SEOW Aristotle Bonganay^a, NG En Qi Zoe^a, ZULKEPLI Muhammad Naqib^a, YADAV Nitish S/O Praduman^a, WU Hui-Wen^a, FONG Siew Lee^b and TEO Shuan Hao^b

^aSchool of Applied Science, Republic Polytechnic; ^bAgriculture Research and Innovation Centre, Republic Polytechnic

Fusarium oxysporum is a persistent fungal pathogen responsible for major crop losses worldwide. Growing concerns over resistance to chemical fungicides have increased interest in insect-derived antifungal alternatives. Blowflies produce antimicrobial compounds (AMCs) as part of their innate immune defence, making them potential sources of novel antifungal compounds.

This study investigated the antifungal activity of crude extracts derived from *Lucilia cuprina* Parts A and B against *F. oxysporum*. Extracts were prepared using varying solvent concentrations to determine optimal solvent composition for recovering AMCs. Conidial and mycelial suspensions were treated with extracts from blowflies reared on normal and special diets, with special diet incorporating prior fungal exposure intended to stimulate production of AMCs. The most effective normal and special diet extracts were combined with commercial fungicide azoxystrobin to assess for potential synergistic effects. Metabolic activity of conidia and mycelia was quantified using alamarBlue assays.

Extracts made using higher solvent concentrations increase extraction of less polar AMCs, that were more effective in inhibiting conidia growth, whereas extracts made using lower solvent concentrations increase extraction of more polar AMCs, which better inhibited actively growing mycelia. Extracts derived from Part B demonstrated stronger antifungal effects than those of Part A. Special diet extracts showed stronger inhibition of conidial growth, whereas their effect on mycelial growth was reduced. Potential synergistic effect between special diet extract and azoxystrobin against mycelia was observed.

These findings highlight the developmental stage and diet-dependent nature of blowfly-derived antifungal compounds, supporting their potential as complementary agents for managing *F. oxysporum* infections.

P20

DETERMINING THE EFFECTS OF SEQM-RPE1 AND SEQM-RPE6 ON CELLULAR PROLIFERATION AND ADIPOGENESIS

Ashlee Eliza TAN, Hazel KOH Jia Xin, Muhd Syukri SHAH S/O Muhd Fitri Vetri, TEE Hui Xuan, WONG Kak Ming, TAN Shixiong

Republic Polytechnic

Traditional meat production contributes significantly to environmental degradation. Cultivated meat potentially offers a more sustainable alternative to address the challenges of a growing global population that lead to the increasing demand for food. However, large-scale production of cultivated meat remains costly, largely due to high media cost and pharmaceutical-grade supplements such as insulin. Identifying cost-effective alternatives is crucial for improving the economic feasibility of cultivated meat. Previous studies reported that methanol sequential organic extracts of plant materials, RPE1 (SEQM-RPE1) and RPE6 (SEQM-RPE6), activated the Akt signalling pathway, suggesting their potential as insulin substitutes. This study aimed to validate their efficacy, determine optimal dosages, and assess their feasibility as plant-based alternatives to insulin. Cell viability was evaluated using the PrestoBlue assay. Adipogenic differentiation was assessed via Oil Red O staining, and gene expression of adipogenic markers was analysed using quantitative polymerase chain reaction (qPCR). Both extracts demonstrated dose-dependent cytotoxicity. Fractionation of RPE1 did not significantly reduce its cytotoxic effects. While SEQM-RPE6 exhibited lower cytotoxicity compared to its crude counterpart, it was unable to fully replace insulin for adipogenesis *in vitro*. Notably, SEQM-RPE6 at 25 µg/mL showed the most promise, as evidenced by improved cell viability and upregulation of adipogenic markers. Further investigations at the protein level and isolation of bioactive compounds are necessary to validate its potential. Overall, SEQM-RPE6 represents a promising step toward reducing reliance on costly growth factors in cultivated meat production.

P21

EXPLORING THE EFFECTS OF GUT COMMENSAL SECRETOME ON COLORECTAL CANCER

Brindamathi D/O GOVINDARAJ V^a, CHUA Xin Ying^a, LEE Jie Ying^a, YET Zu Yi Lydia^a, TAN Shi Yuan Shermaine^a, MA Shaokang^a, Siti HAMIMAH^a

^a*Republic Polytechnic*

Colorectal cancer (CRC) remains a significant global health burden, with gut microbiota dysbiosis emerging as a key contributing factor. In this study, we investigated the effects of the secretomes from *Escherichia coli*, *Enterobacter cloacae*, and *Lactobacillus paracasei* on HCT-116 cells. Changes in the transcriptome were analyzed by RNA sequencing. *E. coli* and *E. cloacae* were found to upregulate pro-tumorigenic pathways while *L. paracasei* appears to induce opposing effects.

P22

EARLY STRUCTURAL AND CORONARY ARTERY CHANGES ASSOCIATED WITH METABOLIC BURDEN AND OBSTRUCTIVE SLEEP APNEA

THE Hui Ing Idelle Teddyatmaja^a, CHUA EnCi^b

^aDiploma in Medical Biotechnology, School of Applied Science, Temasek Polytechnic, ^bAsian Heart and Vascular Centre

Contemporary chest pain evaluation remains heavily centred on identifying flow-limiting coronary stenosis. However, structural and vascular changes may emerge before luminal obstruction becomes apparent. This study examined whether increasing metabolic risk burden and obstructive sleep apnoea (OSA) are associated with early cardiovascular remodelling despite minimal coronary calcium. Six adults aged 40–70 years presenting with chest pain underwent clinical risk stratification, echocardiography, coronary artery calcium (CAC) scoring, invasive coronary angiography, and computed tomography coronary angiography (CTCA). Left ventricular remodelling, aortic dimensions, plaque characteristics, and stenosis severity were evaluated across risk strata. A graded continuum of cardiovascular involvement was observed. Structural remodelling was identified in 4/6 patients (66.7%), all within intermediate and high cardiometabolic risk strata, in the absence of flow-limiting coronary stenosis. Low-risk individuals demonstrated chest pain without measurable structural or coronary abnormality. In contrast, higher-risk patients exhibited left ventricular remodelling and aortic dilatation despite preserved systolic function. Non-calcified plaque was detected in patients with minimal or zero CAC scores, underscoring the limitation of calcium burden as a solitary exclusionary marker. These findings suggest that myocardial and vascular adaptation may precede overt coronary obstruction, reflecting cumulative metabolic load, sympathetic activation, and chronic haemodynamic stress. Rather than viewing coronary artery disease as strictly obstructive or non-obstructive, chest pain may represent a spectrum of subclinical target organ involvement. Integrated multimodality assessment may therefore enable earlier identification of cardiovascular injury and provide a greater window for preventative intervention.

P23

CORRELATION OF BD MAX MULTIDRUG RESISTANT TUBERCULOSIS (MDR-TB) RESISTANCE MARKERS WITH PHENOTYPIC DRUG SUSCEPTIBILITY TESTING (pDST) AND WHOLE GENOME SEQUENCING (WGS)

LIM Rui En Dora^a, NG Yi Kai^b, Nathan LIANG Hao Ping^b, SNG Li-Hwei^b

^aDiploma in Medical Biotechnology, Temasek Polytechnic, ^bCentral Tuberculosis Laboratory, Singapore General Hospital

Multidrug resistant tuberculosis (MDR-TB) is characterized by resistance to both rifampicin and isoniazid antibiotics, and its prevalence is projected to rise by 17% between 2015 and 2025. BD MAX™ MDR-TB assay detects *Mycobacterium tuberculosis* (MTB) DNA, mutations associated with rifampicin resistance in the *rpoB* gene, as well as mutations associated with isoniazid resistance in the *inhA* promoter region and *katG* gene. However, the exact mutations conferring resistance are not reported. The study aims to evaluate the performance of BD MAX MDR-TB assay against phenotypic drug susceptibility testing (pDST) and to identify the exact mutations related to rifampicin and isoniazid resistance which are detected by the assay using whole genome sequencing (WGS) methods. In this retrospective study, 313 samples ordered for the assay between 1st July 2023 and 31st July 2025 were used. The BD MAX results of the samples were analyzed relative to their pDST and WGS results. The analysis showed that BD MAX MDR-TB is a highly reliable tool for ruling out tuberculosis infection due to the high specificity and negative predictive value of >90% in MTB detection, and its accuracy in detecting MTB resistant samples due to an overall concordance of >95% with pDST across *rpoB*, *inhA* and *katG* genes. Although the limited number of MTB positive and resistant samples reduced the precision of the sensitivity and positive predictive value estimates, the study successfully mapped melting temperature shifts for mutations relative to susceptible strains. These findings assist clinicians in interpreting discordant results between BD MAX MDR-TB and pDST.

P24

EVALUATING BOTANICAL PRESERVATIVES TO ENHANCE MICROBIOLOGICAL SAFETY AND EXTEND THE SHELF LIFE OF POST-HARVEST LITOPENAEUS VANNAMEI SHRIMP

LAU Zi Suan¹, Tara GOH¹, MIAO Huang², James LIM Yong Kian^{3,4}

¹Diploma in Veterinary Technology, School of Applied Science, Temasek Polytechnic Singapore

²Centre for Urban Sustainability, School of Applied Science, Temasek Polytechnic, Singapore

³Centre of Aquaculture and Veterinary Science School of Applied Science, Temasek Polytechnic, Singapore

⁴Future Foods Domain, School of Applied Science, Temasek Polytechnic Singapore

Whiteleg shrimp (*Litopenaeus vannamei*), a predominant aquaculture species, is highly susceptible to rapid post-harvest spoilage, limiting shelf life and microbial safety. While sodium tripolyphosphate (STPP) enhances moisture retention and prolongs shelf-life, rising demand for clean-label products necessitates effective natural alternatives. This study evaluated botanical extracts' ability to preserve microbial safety and intrinsic shrimp quality during refrigerated storage. Shrimps were treated with rosemary extract (RE), pomegranate peel extract (PPE), and proprietary formulation X alongside STPP and untreated controls. Citric acid was incorporated to enhance antimicrobial and antioxidant activity. Quality was assessed through a comprehensive evaluation framework consisting: physical (weight change, texture profile analysis), visual (melanosis, orange discolouration), microbiological (total plate count, TPC), and chemical (total volatile basic nitrogen, TVB-N) analyses, enabling cross-validation of spoilage indicators. Formulation X best preserved structural integrity, maintaining the highest muscle firmness ($p < 0.05$) and water-holding capacity throughout storage, indicating delayed autolysis and reduced protein degradation. Although STPP-treated shrimp exhibited greater net weight gain from moisture uptake, this did not translate to superior textural stability. In contrast, botanical-treated shrimp achieved comparable or improved firmness without excessive water incorporation, preserving natural muscle quality rather than artificial weight inflation. Overall, formulation X delivered the lowest TVB-N value (9.38 mgN/100g) and outperformed STPP in suppressing

microbial proliferation. RE and PPE likewise maintained visual quality, achieving melanosis control comparable to STPP. Collectively, these findings demonstrate that botanical preservatives matched or surpassed conventional phosphates in maintaining safety and quality, offering clean-label, integrity-driven alternatives for sustainable shrimp processing.

P25

Capturing GPCR Signalling in Action: Engineering a Cryo-EM Stabilisation Platform for Drug Target Studies

TAN Yan Wei Justin^a, NIU Mu Yuan^b, SHEN Xuan^b, TAN Yong Zi^b

^a*Diploma in Biomedical Science, School of Chemical and Life Sciences, Singapore Polytechnic, 500 Dover Road, Singapore 139651*

^b*Department of Biological Sciences, National University of Singapore, Block S1A, Lee Wee Kheng Building, Level 5 Right Wing # 05-19, 14 Science Drive 4 Singapore 117543*

G-protein coupled receptors (GPCRs) are central mediators of neuron signalling and represent major therapeutic targets in neurodegenerative disorders including Alzheimer's and Parkinsons diseases. High-resolution structural characterization of GPCRs by cryogenic electron microscopy (Cryo-EM) critically depends on homogeneous, conformationally stable protein complexes. This study establishes an optimized end-to-end structural biology workflow to enhance membrane scaffold protein MSP1D1 overexpression and large-scale Nb35 nanobody production for GPCR Cryo-EM application. Systematic host screening identified *E. coli* Acella (DE3) as a superior expression strain compared to its parental BL21 (DE3), enabling improved recombinant protein yield and stability. Nb35 was purified through immobilized metal affinity chromatography (IMAC) followed by size-exclusion chromatography, producing highly pure and monodisperse nanobody preparations. The optimized protocol yielded 1.42 mg/mL in a final 600 μ L volume from a pooled 6L culture. These optimised stabilizing components enabled successful assembly of MSP1D1-based nanodiscs and GPCRs-Nb35 complexes for empirical cryo-EM analysis. Collectively, this work demonstrates that data-driven optimization significantly enhances reproducibility and structural readiness in GPCR workflows, contributing to higher-resolution structural elucidation and future structure-guided drug discovery.

P26

TOWARDS SUSTAINABILITY: ELECTROCATALYTIC CONVERSION OF BENZENE TO PHENOL

LEE Yue Qi^a, LEOW Wan Ru^{b,c}

*^aTemasek Polytechnic, ^bInstitute of Sustainability for Chemicals, Energy and Environment (ISCE²), Agency for Science, Technology and Research (A*STAR), ^cSchool of Chemistry, Chemical Engineering and Biotechnology, Nanyang Technological University*

Phenol is a high-value fine chemical extensively used in pharmaceuticals, polymers and synthetic materials. However, its conventional industrial synthesis via the cumene process is energy-intensive, requiring stringent temperature and pressure control, and is accompanied by substantial carbon emissions and the formation of undesirable by-products. With increasing global emphasis on sustainability, the development of environmentally responsible chemical processes has gained significant attention. In particular, electrocatalysis has emerged as a promising strategy to enhance both efficiency and sustainability. Nevertheless, achieving practical, scalable, and selective electrocatalytic phenol production remains a significant challenge.

This work presents a sustainable one-step alternative for benzene hydroxylation under ambient conditions. Atmospheric oxygen served as a benign terminal oxidant, thereby eliminating the need for hazardous chemical oxidants. An electrocatalyst:mediator assembly was introduced, in which Ir/MnO₂ served as the catalyst and 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ) acted as a redox mediator under blue light-emitting diode (LED) irradiation to promote photo-induced electron transfer. The synergistic coupling of light irradiation and applied current significantly enhanced benzene oxidation, achieving a Faradaic efficiency (FE) of 76% at 50 mA cm⁻².

Overall, this study demonstrates the feasibility and potential of integrating light energy, electrocatalysis, and transition metal oxides to achieve efficient and selective phenol production. This approach offers a promising, environmentally responsible alternative to conventional industrial methods, advancing sustainable fine chemical synthesis.

P27

ADVANCING HEALTH AND TASTE WITH ALLULOSE AS A SUGAR SUBSTITUTE: NOVEL FORMULATION AND PROCESSING

J.S Harinath^a, Putri NUR SHAZLIN BINTE ALI^a, Alaina NORA BINTE NORAZMI^a, Sarah FATIMAH GHAZALI^a, Haneeza IQLIMA BINTE HAZILAH^a, Dr Susmita BANDYOPADHYAY^a, Dr Chiradip CHATTERJEE^a

^aRepublic Polytechnic

The increasing demand for clean-label, low-calorie nutraceutical products has intensified interest in sugar substitutes that are both metabolically favourable and formulation-compatible. This study investigated the feasibility of incorporating allulose, a low calorie sugar substitute, into nutraceutical dosage forms, with a primary focus on effervescent tablets. Conventional excipients such as maltodextrin were used to establish baseline formulations, against which allulose-based systems were systematically evaluated.

A phased experimental approach was employed, beginning with reference benchmarking, followed by formulation development, process optimisation, and physical performance assessment. Critical quality attributes including tablet hardness, friability, weight uniformity, and dissolution time in water were examined. Results demonstrated that allulose-based effervescent tablets could achieve dissolution within two minutes while meeting United States Pharmacopeia friability requirements.

Beyond its sweetening function, allulose exhibited multifunctional behaviour as a bulking agent and secondary disintegrant, contributing to rapid water penetration and tablet breakup. Versatility studies using orange fruit powder, coffee, and neem as active ingredients highlighted the adaptability of allulose-based systems when supported by appropriate process controls and auxiliary excipients.

Overall, the findings indicate that allulose is a viable alternative to conventional bulking sweeteners in effervescent nutraceutical formulations, capable of delivering acceptable mechanical strength and performance without compromising product quality.

P28

OPTIMIZING PHARMACY WORKFLOW WITH WEIGHT-BASED INVENTORY MANAGEMENT

1. Tiara Muraledharan Nair*, 2. LAU Hou Ying Angelina*, 3. WEE Qian Ying*, 4. Eunice TAN Hwee Chee*, Nadia Natasha Binte ZULKIFLI*, Jin Mengqi

^aRepublic Polytechnic, ^bWoodlands Health

Inventory management is critical to hospital pharmacy operations, directly affecting patient safety and workflow efficiency. At Woodlands Health, the outpatient pharmacy manages large volumes of oral solid medications, yet stock-taking and cycle counts remain largely manual and are vulnerable to variability from packaging differences, tablet type, and staff experience. This study evaluates a weight-based inventory management approach using a website-based decision-support tool, TabTally, which estimates tablet quantities from unit weight rather than manual counting.

The objectives were to assess accuracy, compare efficiency with current practice, and examine feasibility in a real outpatient workflow. Oral solid medications were categorized into uniform strip, non-uniform strip, and loose tablet groups, and both methods were tested across different quantity levels. Accuracy was defined as exact agreement with verified counts, while efficiency was measured as time taken per medication.

TabTally demonstrated comparable accuracy to manual counting for strip-packaged medications at higher quantities and improved accuracy for loose tablets. At lower quantities, strip-packaged items showed slightly reduced accuracy with TabTally; however, deviations were limited to within one tablet, whereas manual counting exhibited greater variability. Efficiency gains were most pronounced for loose tablets and increased with quantity, reflecting reduced handling and automated calculation.

Overall, the findings support weight-based counting as a scalable, consistent approach that reduces time burden while maintaining acceptable accuracy for routine inventory activities. Implementation considerations include standardized packaging and weighing protocols and integration with existing information systems to further improve reliability, portability, and long-term impact in high-volume outpatient pharmacy settings and clinical practice contexts.

P29

MOLECULAR SCREENING OF TOMATO CULTIVARS SUSCEPTIBLE TO *TOMATO YELLOW LEAF CURL VIRUS* (TYLCV) AND OPTIMIZATION OF VIRAL INOCULATION FOR EARLY DIAGNOSTIC ASSAYS

Pius TANG Kai Jie^a, Muhammad Aizzel bin MOHAMED FAUZI^a, SEAH Zhi Xuan^a, Aikin Aiman bin ABDULLAH^a, Jacob OMAR CASHA^a, FONG Siew Lee^b, WU Hui- Wen^a, and GAN Eng Seng^a

^aSchool of Applied Science, Republic Polytechnic; ^bAgriculture Research and Innovation Centre, Republic Polytechnic

Tomato Yellow Leaf Curl Virus (TYLCV) is a member of the Begomovirus and is transmitted by whitefly (*Bemisia tabaci*). It is one of the most prevalent viruses affecting tomato cultivation worldwide. Infection by TYLCV results in substantial reduction in fruit yield, causing devastating economic loss for growers. Currently, TYLCV infection is commonly identified through visible assessment of disease symptoms, which may delay treatment. This study aims to optimize the infection and early detection process of TYLCV in tomato. Several tomato cultivars were inoculated with TYLCV through agroinfiltration and agroinjection. The leaf samples were collected at multiple days post-inoculation (DPI) to determine the earliest time point at which viral presence could be detected. In addition to visual symptom observation, viral infection was confirmed via quantitative polymerase chain reaction (qPCR). The high sensitivity and precision of qPCR enable early detection of viral DNA and support the development of diagnostic assays for timely identification of infection. Our results demonstrate that tomato cultivars differ in their susceptibility to TYLCV. Agroinjection enabled earlier and more consistent TYLCV detection than agroinfiltration, making it the more effective inoculation method. Following inoculation, the TYLCV genome can be detected in the plant samples as early as 6 DPI. These findings provide crucial insights into cultivar-specific susceptibility and establish an optimized inoculation and detection workflow for TYLCV. The ability to reliably detect viral DNA as early as 6 DPI demonstrates the potential for developing rapid, sensitive early-diagnostic assays to support disease surveillance and improve management strategies in tomato production.

P30

DEVELOPMENT OF A GENERATIVE AI CHATBOT FOR NATURAL LANGUAGE PATIENT TRIAGE

Natalie CHEONG, Lenice NEO, WONG Ru Bing, Shannon LAU and Joan TAY

Republic Polytechnic

The increasing demand for digital healthcare services has placed pressure on pharmacists, especially in e-pharmacy environments where patient interactions are conducted remotely. The project aimed to develop and evaluate a Generative AI chatbot for natural-language patient triage in a Singapore e-pharmacy setting. A human-centred methodological framework combining Design Thinking, Design and Development, and Design Science Research guided the chatbot's design, implementation, and evaluation.

The chatbot supported three primary interaction pathways: pharmacy counselling for minor ailments, medication refill requests, and drug and supplement enquiries. Natural language processing enabled conversational interactions, while established pharmacy consultation frameworks ensured structured information collection and standardised summarisation for pharmacist review. Feasibility testing used simulated case scenarios to assess accuracy, precision, regulatory adherence, and professional communication.

Results showed that the chatbot performed effectively in low-risk minor ailment cases, producing accurate summaries, maintaining a pharmacist-like tone, and supporting workflow efficiency through prioritisation and structured handover. Limitations were observed in handling high-risk scenarios, prescription-related regulatory requirements, and system integration. Overall, the findings indicate that Generative AI chatbots are a feasible tool for supporting patient triage in e-pharmacy settings, provided comprehensive validation, regulatory alignment, and system integration are achieved before deployment within future digitally enabled pharmacy service delivery models.

Keywords: Generative AI; Patient Triage; E-pharmacy; Natural Language Processing; Digital pharmacy services; Assistive AI chatbot in healthcare

P31

Design, synthesis and modification of Biopolymers for green cosmetic products

Aloysius ONG Zhi Hao^a, ROY Susmita^b

^a*Temasek Polytechnic*, ^b*Greenitio*

Cosmetics are largely used by consumers alike for daily care and aesthetic reasons. The cosmetics market is set to grow upwards of \$100 billion by 2030. However, with cosmetics, comes the petrochemical ingredients used to make many of its products. Such products possess harmful risk to the user and environment. Furthermore, production of petrochemicals consumes large amounts of energy, and deposit hazardous waste to the environment. The current trends by companies are to adopt more sustainable practices for cosmetics products. Such practices include the use of plant-based materials such as tea-tree oil and aloe vera. In this project, we explored the use of biopolymers, specifically Chitosan, and the hydrophobic modification pathways of Chitosan to tailor the biopolymer to fit potential cosmetics and skincare applications. Our findings have found that successful hydrophobic modification was achieved by reacting Chitosan with appropriate hydrophobic reagents, which possessed alkyl chains. Degree of hydrophobic modification ranged from semi-hydrophobic (amphiphilic), to full hydrophobicity, and was measured through solubility test in oil and water. These findings have shown that modified chitosan can provide properties suitable for cosmetic applications such as emulsification, moisture retention, and improved integration in cosmetic formulations, highlighting its potential as a sustainable alternative to conventional petrochemical-based cosmetic ingredients.

P32

Reimagining Food: Integrating Bioprinted Texture and Food-Derived Bioinks for Cultivated Meat

Min Yu Jacia LEE^a, Sylvia Shi Qi TAN^a, Nadyr Nabil Bin KHAIRUDIN^a, Wei Hong LAW^a, Jie Min ANG^a, Clarisse Wan Qian ZHUO^a, Manchao WU^{a,*}, Louis Jun Ye ONG^{a,b,*}

^a*Temasek Polytechnic, School of Applied Sciences. 21 Tampines Avenue 1, Singapore 529757*

^b*Future Food Domain, Temasek Polytechnic. Singapore 529757*

Cultivated foods, particularly cultivated meat, are increasingly recognised as a sustainable solution to meet the growing global demand for protein-rich nutrition. However, beyond supply capacity, consumer acceptance depends heavily on the ability of these products to replicate key structural features such as fat marbling and fibrous architectures, which ultimately define mouthfeel and eating experience.

Current cultivated meat production typically relies on large-scale bioreactor expansion of cell suspensions¹, followed by blending harvested cells with food-based ingredients prior to cooking. While scalable, this approach offers limited control over micro- and macro-structural organisation², resulting in products that struggle to faithfully reproduce conventional meat textures.

To address this limitation, we developed an integrated food bioprinting framework spanning bioink formulation and hierarchical structural fabrication. We first investigated accessible, food-grade bioinks capable of supporting both extrusion-based printability and prolonged cell culture. The mechanical and structural properties of the printed constructs were characterised before and after thermal processing to evaluate texture retention. In parallel, we established a high-resolution extrusion bioprinting protocol capable of printing through an 18G nozzle at 50 kPa, enabling controlled reconstruction of micro- and macro-scale food architectures with millimetre-scale precision.

As proof of concept, we demonstrated the feasibility of bioprinting high-granularity rice-based structures (kueh salat) and beef fat marbling patterns, mimicking rice grain heterogeneity and fatty streak distributions at millimetre-scale accuracy. Texture analysis revealed up to 73% similarity to raw fish and chicken matrices. Carrageenan and konjac were identified as promising candidates due to their patternability, rapid solidification behaviour, and ability to maintain structural integrity throughout cell culture and cooking processes.

This framework provides a scalable strategy for replicating complex food textures and advances cultivated food production from cellular expansion toward structurally engineered, consumer-ready products.

REFERENCES:

1. Ngwa, Che Julius, et al. "Bioreactor parameters and systems for cultured meat production." *Future Foods* (2025): 100796.
2. Ozturk, Oguz K., and Bruce R. Hamaker. "Texturization of plant protein-based meat alternatives: Processing, base proteins, and other constructional ingredients." *Future Foods* 8 (2023): 100248.

P33

PREVALENCE AND RISK FACTORS OF UNDIAGNOSED NEUROPATHY IN PEOPLE WITH DIABETES IN SINGAPORE

Shamsubahurudin SHAMSUDDIN^a, Sanchi DUA AVINASHI^b, Manasi^b, Dinesh NATARAJAN^b, Tosha KALHAN^b, Raina WADHWA^b, CHEW Sher Mein^b, Kavita VENKATARAMAN^b

^a*School of Applied Science, Medical Biotechnology, Temasek Polytechnic*

^b*Saw Swee Hock School of Public Health, National University of Singapore*

Diabetes mellitus (DM) is an increasing public health concern in Singapore, with rising lower-extremity complications such as diabetic peripheral neuropathy (DPN). DPN is a common form of nerve damage affecting the lower limbs and increases the risk of foot ulcers, infections, and eventual amputations. In Singapore, an average of 5 diabetes-related lower-limb amputations is reported daily, raising concerns about gaps in early detection. This study aimed to determine the prevalence of undiagnosed DPN and identify factors associated with its underdiagnosis among individuals with diabetes. A cross-sectional secondary data analysis was conducted using de-identified baseline data from the parent RECODER study. Participants underwent objective DPN assessments using standardised clinical screening tools, and individuals demonstrating neuropathy without a prior diagnosis were classified as having undiagnosed DPN. Descriptive statistics were used to estimate prevalence, while univariate analyses and multivariable logistic regression identified factors associated with underdiagnosis. Among 915 participants, 22.7% had DPN, of whom 86.5% had no prior diagnosis, indicating a substantial detection gap. Duration of diabetes was the only independent factor significantly associated with undiagnosed DPN. These findings suggest that DPN may develop earlier than anticipated and remain unnoticed without systematic screening. Strengthening early screening strategies may improve detection, reduce preventable complications, and enhance long-term outcomes among individuals living with diabetes.

P34

Comparing the antioxidant effect of Edaravone and Epigallocatechin gallate on a cell culture model of Non-Alcoholic Fatty Liver Disease (NAFLD)

Adrian Amarjeet WILLIAMS^a, Arham Ahmed FIROZ^a, WONG Yu Da^a, Sanjay S. NAIR^a, THE Kai Ting^a, TANShi-Xiong^a

^aRepublic Polytechnic, School of Applied Science, Diploma in Biomedical Science

Non-alcoholic fatty liver disease (NAFLD) is a progressive metabolic disorder driven by dysregulated lipid metabolism and oxidative stress, culminating in hepatocellular injury. The adverse effects of current therapeutic strategies have prompted investigation into safer alternatives, including natural antioxidants. This study established a cell culture model to evaluate whether the synthetic antioxidant Edaravone and the natural antioxidant Epigallocatechin gallate (EGCG) affects lipid accumulation and modulate Nrf2-related gene expression in palmitic and oleic acid treated Hep3B cells.

Hep3B cells were exposed to free fatty acids (200 μ M, 24 hours) to simulate lipid accumulation, followed by 24 hours of antioxidant treatment (Edaravone 10 μ M, EGCG 20 μ M, or both). Intracellular lipid deposition was quantified using Oil Red O staining. Expression of genes involved in oxidative stress and lipid metabolism (PNPLA3, Nrf2, HMOX-1, NQO1, GCLC) was examined via qRT-PCR.

Fatty acid exposure of Hep3B cells resulted in lipid accumulation alongside upregulation of PNPLA3, Nrf2, and HMOX-1. Antioxidant interventions potentially reduced lipid accumulation in this cell culture model. These findings suggest a potential link between oxidative stress defence gene regulation and exogenous antioxidant effects on lipid accumulation, supporting the potential therapeutic potential of antioxidant-based strategies in NAFLD.

P35

MONITORING PATHOGENIC YEASTS IN BIRD DROPPINGS: A ONE HEALTH APPROACH

Hao-Rong HO^a, Wing-Yan SO^b, Pak-Ting HAU^b, Eddie Chung-Ting CHAU^b, Chi-Ching TSANG^c, Franklin Wang-Ngai CHOW^{b,*}

^a*School of Applied Science, Nanyang Polytechnic, Singapore;*
henryhhr23@gmail.com (H.-R.H.)

^b*Department of Health Technology and Informatics, The Hong Kong Polytechnic University, Hong Kong, China;* swy1234abcd@gmail.com (W.-Y.S.); pak-ting-patrick.hau@connect.polyu.hk (P.-T.H.); chungtingeddie.chau@connect.polyu.hk (E.C.-T.C.)

^c*School of Medical and Health Sciences, Tung Wah College, Hong Kong, China;* cctsang@twc.edu.hk (C.-C.T.)

**Correspondence:* franklin.chow@polyu.edu.hk (F.W.-N.C.)

The tackling and understanding of environmental yeast infections cannot be focused solely on humans as the cornerstone concept of 'One Health' suggests that the health of humans, animals and environment are intrinsically interrelated. The key objective of this project is to monitor any emerging thermotolerant disease-causing, fungal pathogens that could potentially endanger public health. A total of 201 different yeast isolates were recovered from bird droppings around Hong Kong (HK) SAR, China, and its identity were determined by ITS sequencing with 100% of the collected isolates classified in the Fungal Pathogen Priority List, *C. albicans*, *C. glabrata*, *C. krusei* and *C. tropicalis*, showing excellent 42°C heat tolerant. Antifungal susceptibility testing via CLSI M44 disc diffusion guideline was rigorously performed to single out isolates that manifested resistance towards certain antifungals, which were subsequently tested using broth minimum inhibitory concentration (MIC) for other antifungals listed by the guidelines of EUCAST. The multi-drug-resistant isolates being detected reflects the outlook of antifungal resistance evolvement that induces clinical implications such as limited antifungal options for treatment. This study, also noted by the Casadevall's environment competency theory, reinforces the notion of a constant one health surveillance to monitor any emerging antifungal resistance patterns in the environment.

P36

Molecular Breeding of Leafy Vegetable Varieties

AGNOTE Ezekiel Staples^a, TAN Grace^b, GOH Kasey^b, DAISUKE Urano^b

^a*School of Chemical and Life Sciences, Singapore Polytechnic*

^b*Laboratory of Urano Daisuke, Temasek Life Science Laboratories*

Rising global temperatures and increasing demand for controlled-environment agriculture have intensified the need to develop crop varieties that perform well under abiotic stresses such as heat and low light. This study investigates the physiological responses of mutant lettuce (*Lactuca sativa* cv. 'Grand Rapids') lines generated through CRISPR-Cas9-mediated genome editing to identify traits associated with improved stress tolerance using gene knockout of line X and Y. Seven-day-old seedlings were transformed using *Agrobacterium tumefaciens*, regenerated through callus culture, and propagated to obtain genetically stable lines. Wildtype plants (GR) and two mutant lines (X and Y) were subjected to heat (22°C vs. 30°C) and shade treatments for 28 days. Plant growth and physiological responses were evaluated through image-based phenotyping, measuring top-view area, area fill, and Green Leaf Index (GLI), alongside biomass and leaf morphology. Mutant lines, particularly line Y, consistently exhibited greater plant area, GLI, and biomass compared to wildtype under both stress conditions. Under shade treatment, mutants maintained a more compact plant shape with increased area fill and brighter green leaf coloration, possibly indicative of improved light-use efficiency. Leaf morphological analysis further suggested that mutant lines possess structural traits associated with shade resilience. These findings highlight the potential of targeted genetic modification to enhance stress tolerance in lettuce and support the development of cultivars better suited for sustainable indoor and climate-resilient farming systems.

P37

ESTABLISHING AND COMPARING HAEMATOLOGICAL REFERENCE VALUES OF SWISS WEBSTER, C57BL/6, AND NSG MICE

CHONG Rachael^a, Sebastian Jose DAVID^b

^aTemasek Polytechnic, ^bSingHealth Experimental Medicine Centre

The CBC is a widely used haematological test in biomedical research for health monitoring and disease assessment. Although reference values for laboratory mice are available in the literature, they may not accurately reflect facility-specific conditions. Therefore, this study aimed to establish and compare haematological reference values for Swiss Webster, C57BL/6, and NSG mice, the three common laboratory mouse strains housed within the facility. Blood samples were collected via the submandibular vein from 32 female Swiss Webster mice, 35 C57BL/6 mice, and 21 NSG mice. Samples were then analysed using an automated haematology analyser to obtain CBC parameters, including RBC counts and indices, WBC counts and differentials, as well as PLT parameters. Descriptive statistics and statistical analyses using two separate one-way ANOVA tests were conducted to determine haematological differences between strains and sexes within each strain. Results concluded that NSG mice exhibited the lowest WBC and LYM counts, alongside higher NEU and MON counts compared to Swiss Webster and C57BL/6 mice. Minimal differences were observed between sexes within each strain, with significant differences detected only for MCH and MCHC in NSG mice. In contrast, significant differences between strains were identified for multiple haematological parameters, particularly WBC counts and differentials, RBC counts, HCT, MCV, MCH, RDW, and PLT count ($p < 0.05$). Despite limitations including small sample sizes and wide age ranges, the findings highlight the importance of periodically revising and updating local haematological reference values for consistent, accurate interpretation of CBC results.

P38

SCREENING AND EVALUATION OF INSECT-DERIVED COMPOUNDS AGAINST BACTERIAL PATHOGEN (*Pseudomonas syringae* pv. *tomato*)

Ashley ONG Qi Hui^{a*}, Ignacia NATHAR Yi Ni Si^{a*}, WANG En Qi^{a*}, Irene WANG Min Xin^{a*}, Sarah Athira Binte Ashraf Stephen FOREMAN^{a*}, FONG Siew Lee^b, TEO Shuan Hao^b and WU Hui-Wen^a

^a*School of Applied Science, Republic Polytechnic, Singapore;* ^b*Agriculture Research and Innovation Centre, Republic Polytechnic;* **These authors contributed equally to this work*

Urban farms require sustainable and residue-safe plant protection strategies, particularly for high-value crops such as tomato that are vulnerable to bacterial pathogens. This study investigated the antimicrobial and plant immune-activating potential of insect-derived antimicrobial compounds (AMCs) extracted from blowfly biowaste against *Pseudomonas syringae* pv. *tomato* DC3000. Solvent extracts prepared from pupae and adult fly biowaste were screened and evaluated through *in vitro* and *in vivo* assays.

Antibacterial activity was first assessed using disk diffusion screening, where selected AMC (A4 and B4) produced significantly larger zones of inhibition than synthetic antimicrobial peptide controls ($p < 0.001$). Minimum inhibitory concentration (MIC) testing by broth dilution showed stronger potency for A4 compared with B4, indicating pathogen growth suppression at lower concentrations. These results confirm that insect-derived extracts contain active antibacterial components.

Plant immune responses were evaluated through defence gene expression analysis in *Arabidopsis thaliana* at multiple time points after AMC treatment. AMC exposure upregulated key gene markers linked to Systemic Acquired Resistance (SAR) and Induced Systemic Resistance (ISR), including *AtPR1*, *AtPR5*, *PDF1.2*, and *VSP2*. Fraction B4 produced relatively stronger ISR-associated responses, indicating functional differences between extracts. This combined antimicrobial and immunomodulatory activity suggests AMCs can provide both direct pathogen inhibition and host defence priming.

Overall, insect-derived AMCs demonstrate promising properties for sustainable

crop protection. Converting insect biowaste into bioactive extracts supports circular economy approaches and reduces reliance on synthetic pesticides. Future studies should focus on compound characterization, mechanism-of-action analysis, formulation optimization, and controlled crop trials to validate agricultural applications.

P39

PHYLOGENETIC DIVERSITY AND PHENOTYPIC PLASTICITY IN TOXIN PRODUCTION BY *SYMBIODINIACEAE* STRAINS

PAU Dominic Joe Jien^a, CEAPA Holly^b, PETROU Katherina^b

^a*Temasek Polytechnic, Singapore*, ^b*Petrou Lab, University of Technology, Sydney*

Marine microalgae known as *Symbiodiniaceae* are an important group of marine dinoflagellates that form symbiotic relationships with various marine creatures in tropical waters. In symbiosis, the host organism provides the algal endosymbionts with shelter and nutrients. In return, the symbiont provides sugars and lipids produced through photosynthesis to the host. Corals are in decline worldwide, due to a phenomenon known as coral bleaching: the loss of symbionts from coral tissue. It is generally hypothesised that these endosymbionts cause coral bleaching due to the production of Reactive Oxygen Species (ROS). However, to date this has never been shown empirically. Interestingly, these symbionts have been shown to produce toxins, yet little research has been done on zooxanthellatoxins produced by *Symbiodiniaceae*, particularly in relation to coral health. This study aims to broaden the understanding on the phylogeny and phenotypic plasticity of zooxanthellatoxins in *Symbiodiniaceae* in response to temperature stress. Four different strains of *Symbiodiniaceae* were subjected to two temperatures, 25°C and 30°C, and subsequently their photosynthetic health was tested, as well as sampled for toxin production, if any. Changes in the photo physiology from the increased temperature were recorded and analysed. The findings helped to bring forth information, regarding which strains of *Symbiodiniaceae* can be considered more heat tolerant and will help to link the role of toxin production with phylogeny and temperature stress.

P40

BEYOND THE BEAT: DECIPHERING THE “HEART-BRAIN” LINK IN PALPITATION DIAGNOSIS

Zephyr TAN Xuan Qi^a, CHUA En Ci^b

^aDiploma in Medical Biotechnology, Temasek Polytechnic, School of Applied Science, ^bAsian Heart and Vascular Centre

The clinical evaluation of palpitations frequently encounters a diagnostic bottleneck where patients with non-diagnostic cardiac tests are mislabelled with psychiatric anxiety, resulting in a 3.5 to 7-year delay in identifying autonomic dysfunction. This study aimed to bridge this gap by developing the Dysautonomia-Arrhythmia Palpitation Differentiator (DAPD), a data-driven scoring model designed to distinguish between cardiac-arrhythmic and autonomic aetiologies.

Utilizing a retrospective cohort of 40 patients and adhering to the 10:1 Events Per Variable ratio for model stability, the study analysed predictive utility of four key variables: change in heart rate, change in systolic blood pressure, syncope, and pre-syncope. Bivariate screening and multivariate binomial logistic regression revealed a Hemodynamic-Symptomatic Paradox, where changes in heart rate ($p=0.147$) and systolic blood pressure ($p=0.226$) were statistically non-significant. This suggests that pharmacological beta-blockade often blunts the natural physiological response, making snapshot vitals deceptive in medicated populations.

Conversely, between pre-syncope and syncope, the former emerged as a pathognomonic neuro-autonomic fingerprint with 100% sensitivity in the dysautonomia cohort ($p < 0.001$). By synthesizing regression coefficients into a weighted 3-point system, the DAPD model achieved an outstanding validated accuracy of 92.5%. Findings suggest that rather than a binary obstructive versus benign interpretation, chronic palpitations represent a spectrum of neuro-cardiac dysregulation. By prioritizing the warning phase over the severity of ultimate hemodynamic collapse, this framework transforms clinical narratives into an objective triage tool. The DAPD model provides a scientifically rigorous pathway for optimizing specialist referrals and reducing the diagnostic latency that currently characterizes the diagnostic odyssey for autonomic patients.

P41

DESIGNING EFFECTIVE PUBLIC EDUCATIONAL APPROACHES TO KIDNEY HEALTH

Ethel CHEE Yan Lin^a, Irfath Irshana D/O RIAS^a, Sanjana SHETTY^a, Shakeena SAFRIN Mohamed Thambi^a, TENG Wan Lin^a, MA Zhen^a, Siti NURBAYA Ramli^a, Cherry CHAN^a, Daron NA^b

^aRepublic Polytechnic, ^bNational Kidney Foundation Singapore

Chronic kidney disease is an irreversible condition that damages kidney structure and function over time. It was found to be amongst the top 10 causes of death in high-income nations such as Singapore, Greece and Israel. Despite its rising prevalence, many individuals, especially youth, continue to overlook the significance of common risk factors that contribute to this condition.

Following a previous student-led study that identified workshops as one of the least effective motivational sources based on student perceptions, this project sought to evaluate and challenge this belief by implementing an interactive workshop-based approach to kidney health amongst youth aged 18-27. Conducted in collaboration with the National Kidney Foundation Singapore, four workshop sessions were held over the June academic break, featuring educational games, engaging discussions, and a hands-on kidney dissection. Participants completed pre- and post-workshop quizzes, and their scores were analyzed. A total of 53 valid responses were collected throughout the four sessions, after which a one-tailed paired t-test was conducted with a significance threshold (α) of 0.05. Analysis of results showed a statistically significant increase in awareness and knowledge of kidney health after the workshop (p -value < 0.05, $t_{\text{stat}} > t_{\text{critical}}$).

Additionally, feedback gathered following the workshop was found to be overwhelmingly positive, supporting the effectiveness of a workshop-based educational approach. Future improvements could include increasing the sample size, recruiting a more diverse participant pool across different schools as well as simplifying content for students without a science background to ensure broader outreach and a greater impact on participants.

P42

Nanoarchitected Collagenous Shark Egg Cases: Structural and Biological Characterization

**Deekshika Muthiah,^{1,2} Hyok Zing Png,^{1,2} Joey Hui Min Wong,¹
Belynn Sim,^{1,3} Xian Jun Loh,^{1,3} Rubayn Goh¹ ***

¹*School of Chemical & Life Sciences, Singapore Polytechnic, 500 Dover Rd, 139651, Singapore*

²*Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology and Research (A*STAR), 2 Fusionopolis Way, #08-03 Innovis, Singapore 138634, Republic of Singapore*

³*School of Materials Science and Engineering, Nanyang Technological University (NTU), Singapore 639798, Republic of Singapore*

Keywords: collagen, bioinspired materials, nanolattice, small-angle X-ray scattering

Shark egg cases, often referred to as “mermaid’s purses,” present a remarkable example of naturally evolved nanoarchitected materials. They are composed primarily of hierarchical collagen networks that provide mechanical resilience necessary to protect developing embryos in harsh marine environments. Unlike mammalian tissues, which contain fibril-forming collagen, shark egg cases are built from nanolattice-forming collagens that assemble into branched, mesh-like networks. These unique collagen architectures are of interest as potential biomaterials, as collagen is widely used in tissue repair but mammalian-derived sources may pose risks of immunogenicity and disease transmission.

In this study, shark egg cases collected from multiple Asia–Pacific shark species were structurally characterised to better understand their collagen organisation and biomedical potential. Small-angle X-ray scattering was employed to investigate the nanoscale arrangement of collagen within the egg cases. The data revealed a highly ordered nanolatticed arrangement with quasi-lamellar periodicity, confirming that the collagen assembles into a regular, non-fibrillar network distinct from conventional mammalian collagen materials. Building on this structural finding, the cytocompatibility of shark egg case-derived collagen will be evaluated using cell culture assays to assess its suitability for biomedical applications. Overall, this work establishes shark egg cases as a naturally evolved model of nanolattice-forming collagen and highlights their potential as a sustainable alternative, marine-derived scaffold material for regenerative medicine and bioinspired material design.

P43

MITOCHONDRIAL DNA ENRICHMENT FOR *Aedes Aegypti* COMPLETE MITOGENOME SEQUENCING

**SOH Yin Jun^a, Surya Pavan YENAMANDRA^b, LIM Ming Jie^b,
Hapuarachchige Chanditha HAPUARACHCHI^b**

^a*School of Applied Science, Temasek Polytechnic*

^b*Environmental Health Institute, National Environmental Agency, Singapore*

Mitochondrial DNA (mtDNA) sequencing enables lineage tracing and haplotype characterization in *Aedes aegypti*, a primary dengue vector in Singapore. However, high-throughput workflows for efficient mtDNA recovery remain underexplored in arthropods, limiting their application in large-scale surveillance programmes such as Project *Wolbachia*. To address this gap, we optimized automated tissue homogenization strategies to improve scalability and throughput and evaluated the performance of commercially-available mitochondrial enrichment and DNA extraction kits. Extracts from the optimized workflow were then subjected to PCR-free shotgun sequencing to minimize amplification bias during whole mitogenome generation.

The optimized homogenization protocol significantly improved mtDNA yield by processing mosquito samples in a mixer mill at 900 rpm, under cold conditions and a newly defined sucrose-HEPES buffer. This homogenization approach was applicable across the six evaluated kits, replacing manual grinding for bulk sample processing. Though all kits were compatible with arthropod samples, those incorporating DNA extraction achieved higher mitogenome recovery than kits with enrichment-only workflows, suggesting that DNA extraction methods influence sequencing outcomes. Moreover, sequencing coverage ranged from 36% to 99% on mtDNA extracted using different evaluated protocols. Consistent recovery of certain genomic regions despite low overall coverage suggested the potential presence of nuclear mitochondrial pseudogenes (NUMTs), highlighting the need for careful interpretation of haplotype data. Regardless of the protocol, DNA yields were insufficient for long-read next generation sequencing (NGS). Nevertheless, the optimized workflow proved efficient and robust on short-read NGS platforms, generating near-complete, unbiased mitogenomes for routine haplotype-based surveillance and genomic monitoring of mosquito populations to support vector control strategies.

P44

FORMULATION OF 3D PRINTED PERSONALISED NUTRACEUTICALS USING SUSTAINABLE MATERIALS

**Yu Kaijie, Chua Xuan Ru Cheryl, Muhammad Firdaus Bin Muhammd
Faizal, Soh Jing Rong Jovan, Loh Jia Wei, Josefina Seow, Felicia
Liew**

Republic Polytechnic

This project investigates the viability of utilizing food waste, specifically okara, as a natural binder in the formulation of three-dimensional printed tablets produced through semi solid extrusion. The study is driven by increasing global interest in sustainable manufacturing and the need for environmentally responsible alternatives to conventional pharmaceutical excipients. Okara, nutrient rich by product of soybean processing, presents natural binding properties, biodegradability and wide availability, making it a promising candidate for green pharmaceutical applications. The project begins with the characterization of okara to determine its chemical and physical suitability for extrusion-based tablet production, followed by formulation development using various compositions to obtain a printable and structurally stable paste. The final tablets manufactured using these formulations successfully passed the moisture analysis, uniform weight, friability, hardness test and dissolution test. The results presented below confirms that okara can serve as a functional binder capable of supporting tablet formation via three-dimensional printing.

P45

Microbial cell factory for retinoid biosynthesis

Cheng Rui Yang Joshua, Chiradip Chatterjee, Chen Xixian

School of Applied Science, Republic Polytechnic, Singapore Institute of Food and Biotechnology innovation, ASTAR

This paper explores the development of microbial factories using *E. coli* capable of producing retinyl acetate on a large scale. Retinyl acetate is highly favored in the market due to being a highly stable precursor to retinoic acid, which has desirable properties in skincare. Retinyl acetate is acetylated from retinol by alcohol acetyltransferase (AAT). Incorporating a “Plug-and-Play” system, various AAT genes were screened from bacterial and plant-based sources. The genes are cloned into a plasmid with an already established retinol-producing pathway and evaluated based on their ability to produce retinyl acetate.

Across the screened AAT variants, there was suboptimal production of retinyl acetate, which was attributed to the lack of AAT expression despite verified cloning. Findings have also shown that there was a huge metabolic and expression burden effect on the host from the implantation of the AAT gene. These findings highlight the challenges of metabolic work, especially in the field of retinyl acetate. However, the study contributes to a better understanding of dodecane’s in situ sink role in retinoid synthesis and provides a clear direction for future work focusing on AAT expression optimization.

Keywords: Retinyl Acetate; alcohol acetyltransferase (AAT), retinoid, metabolic engineering, dodecane