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SURE 2020 Undergraduate Science Conference Booklet

SURE Network

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16th October 2020

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Welcome from the SURE Network

It is an honour to welcome scientists and students from around Ireland to the third series of the SURE Network's undergraduate research conferences. This year's online conference provides us, for the first time, with an opportunity to have presentations from nine different Higher Education Institutions at a single conference. We very much look forward to discussing the excellent work that will be showcased in these presentations.

I wish to thank all the members of our innovative Conference Committee who have developed an exciting new format for the conference at such a challenging time. My thanks to Cormac Quigley, Therese Montgomery, Julie Dunne, Eileen O'Leary and Janette Walton for the countless hours they have invested in preparing for today, going well above and beyond the call of duty.

I have had the pleasure of co-chairing the Programme Committee for the conference, which has provided me with an opportunity to see the marvellous work being carried out by students and their supervisors in higher education around Ireland. I wish to thank all those involved in the preparation of abstracts, in particular the students, for their hard work. I also wish to thank my co-chair on the Programme Committee, Anne Marie O'Brien, and the members of the committee, Orla Slattery, Janette Walton, Eileen O'Leary and Greg Byrne, as well as the 40 reviewers around the country who reviewed the students' submissions.

As I conclude my term as Chairperson of the SURE Network, I want to thank everyone who has contributed to the success of this partnership over the past four years. I wish Therese Montgomery the very best as the incoming Chairperson, and I look forward to seeing the SURE Network going from strength to strength under her leadership.

Ciaran O'Leary, SURE Network Chairperson



A note from the Local Organizing Committees

Galway-Mayo Institute of Technology

I would like to express my gratitude, as co-chair of the National Organising Committee to all the members of the SURE Network who have contributed to this year's conference. Moving the conference from the real world to the virtual is something that has only happened with the commitment and enthusiasm of the wider SURE Network and the National Programme Committee. I would also like to thank my fellow co-chair, Dr Therese Montgomery who has been invaluable in making this year's conference come together. A special thank you to Dr. Anne Marie O'Brien for the annual organization of conference polling and digital badges. In addition, recognition should be given to each of the members of the GMIT Local Organising Committee who have given their time in organizing this conference.

Finally, I am looking forward to seeing the SURE2020 GMIT stream. I am confident that the hard work of the students and supervisors across the country will be evident to see. It is a testament to all, that even in these uncertain times, such a high quality of research is on display.

Dr Cormac Quigley, Chair of the Galway-Mayo Institute of Technology Local Organising Committee

Technological University Dublin

I would like to sincerely thank the members of the TU Dublin Local Organising Committee including Greg Byrne, Alan Casey, Denis O'Shea and Aine Whelan from the College of Sciences and Health City campus; Yurgos Politis from the Learning Teaching and Technology Centre; and Sinead Loughran from Dundalk IT. They have worked enthusiastically throughout the considerable planning for SURE2020. They have given of their time and expertise, and reacted with positivity and with competence to migrate the conference to the virtual world.

I would also like to thank all the students and their supervisors from across Ireland for their contributions to the Health Science and Nutrition Stream, which has resulted in a very high quality conference proceeding for the TU Dublin stream of SURE2020.

Dr Julie Dunne, Chair of the TUDublin Local Organising Committee

Cork Institute of Technology

We would like to sincerely thank the members of the Local Organising Committee from Cork Institute of Technology (CIT), in particular Dr Donagh O'Mahony, Dr Mary Lehane and Dr Suzanne Floyd. We would also like to thank Dr Tim Horgan, Head of Faculty of Engineering and Science for his continued support with, engagement in and promotion of this conference.

We would also like to extend our gratitude to Mary Good, who continually supports new initiatives and shows great passion and enthusiasm for supporting STEM Education. We look forward to her inspiring keynote presentation at the onset of the conference, we are always proud to welcome her back to encourage, enlighten, empower and motivate our graduates.

We would particularly like to thank all the students and their supervisors from across Ireland for their contributions to the Analytical, Environmental and Pharmaceutical Science Stream which has resulted in very high-quality conference proceeding for the CIT stream of SURE2020. We look forward to welcoming you all to this stream on Friday.

Dr Janette Walton and Dr Eileen O'Leary, Chairs of the Cork Institute of Technology Local Organising Committee



SURE Network Members

Ciarán O'Leary, TUDublin, (Chair of the SURE Network)

Therese Montgomery, Athlone Institute of Technology,
(Deputy Chair of the SURE Network)

Dina Brazil, Institute of Technology, Carlow

Greg Byrne, Technological University Dublin

Eva Campion, Institute of Technology, Sligo

Emma Caraher, Technological University Dublin

Tracey Coady, Waterford Institute of Technology

Gordon Cooke, Technological University Dublin

Geraldine Dowling, Institute of Technology, Sligo

Julie Dunne, Technological University Dublin

Karen Finn, Galway-Mayo Institute of Technology

Patricia Heavey, Athlone Institute of Technology

Laura Keaver, Institute of Technology, Sligo

Claire Lennon, Waterford Institute of Technology

Sinead Loughran, Dundalk Institute of Technology

Fiona McArdle, Institute of Technology, Sligo

Margaret McCallig, Institute of Technology, Sligo

Valerie McCarthy, Dundalk Institute of Technology

Hugh McGlynn, Cork Institute of Technology

Anne Marie O'Brien, Athlone Institute of Technology

Eileen O'Leary, Cork Institute of Technology

Ciarán O'Leary, Technological University Dublin

Carloalberto Petti, Institute of Technology, Carlow

Cormac Quigley, Galway-Mayo Institute of Technology

Annamarie Rogers, Dundalk Institute of Technology

Lisa Ryan, Galway-Mayo Institute of Technology

Arjan van Rossum, Dundalk Institute of Technology

Barry Ryan, Technological University Dublin

Matt Smith, Technological University Dublin

Nicolas Touzet, Institute of Technology, Sligo

Josephine Treacy, Limerick Institute of Technology

Janette Walton, Cork Institute of Technology

SURE Network virtual Conference 2020 Committees

SURE 2019 Local Organising Committee

– Carlow

SURE National Conference Committee

- Cormac Quigley (Co-Chair),
Galway-Mayo Institute of Technology
- Therese Montgomery (Co-Chair),
Athlone Institute of Technology
- Julie Dunne,
Technological University Dublin
- Eileen O'Leary,
Cork Institute of Technology
- Janette Walton,
Cork Institute of Technology

SURE National Programme Committee

- Ciaran O'Leary (Co-Chair),
Technological University Dublin
- Anne Marie O'Brien, (Co-Chair)
Athlone Institute of Technology
- Orla Slattery,
Galway-Mayo Institute of Technology
- Janette Walton,
Cork Institute of Technology
- Eileen O'Leary,
Cork Institute of Technology
- Greg Byrne,
Technological University Dublin

SURE2020 Cork Institute of Technology

Local Organising Committee

- Eileen O'Leary, (Co-Chair)
- Janette Walton, (Co-Chair)
- Donagh O Mahony
- Mary Lehane
- Suzanne Floyd

SURE2020 Galway-Mayo Institute of Technology**Local Organising Committee**

- Cormac Quigley (Chair)
- Karen Finn
- Orla Slattery
- John Healy
- Carolyn Wrafter
- Philip White
- Joan O'Keefe
- Fiona Kavanagh
- Sheila Faherty
- Aisling Crowley
- Heather Lally

SURE2020 Technological University Dublin Local**Organising Committee**

- Julie Dunne (Chair)
- Greg Byrne
- Alan Casey
- Denis O'Shea
- Aine Whelan
- Yurgos Politis
- Sinead Loughran (Dundalk Institute of Technology)

SURE2020 Network Virtual Conference - programme overview:

9:00 – 9:30 Zoom Registration

- 9:30 Opening by Ciaran O’Leary, Chair of the SURE Network
- 9:35 Address by Minister for Further and Higher Education, Research, Innovation and Science, Simon Harris
- 9:45 Launch of the SURE Network National Student Survey, Dr Therese Montgomery, Chair of the SURE Network Curriculum Committee.
- 9:50 CIT Keynote 1: Mary Good, COO American Chamber of Commerce, CIT Graduate
- 10:10 - 11:30 Oral Presentations – Three parallel sessions

Stream 1: Analytical, Environmental and Pharmaceutical Science

Stream 2: Health Science and Nutrition

Stream 3: Biological, Sport, Computing, Mathematical and Physical Sciences

11:30 - 11:35 Audience Voting ends for SURE 2020 Best Science Communicator

11:35 - 12:00 Break

- 12:00 – 12:20 GMIT Keynote 2: Dr Ian O’Connor, Senior Lecturer and Marine Scientist, GMIT
- 12:20 - 13:00 Online Posters - Three parallel sessions

Posters will be presented as one minute flash presentations; posters available online @ <http://sure-network.ie/conference/> on the day

Stream 1: Analytical, Environmental and Pharmaceutical Science

Stream 2: Health Science and Nutrition

Stream 3: Biological, Sport, Computing, Mathematical and Physical Sciences

13:00 - 14:00 Lunch and poster review

- 14:00 Audience Voting ends for SURE2020 Best Scientific Poster
- 14:10 TU Dublin Keynote 3: Prof. Paula Bourke, University College Dublin, DKIT Graduate
- 14:30 Virtual Presentation of Prizes by Institute Presidents:
Dr Orla Flynn, GMIT, Dr Barry O’Connor, CIT and Prof David FitzPatrick, TU Dublin
- 15:00 Update from SURE Network Undergraduate research journal SURE-J
- 15:05 Update from the SURE Network National Student Survey
- 15:10 Postgraduate Opportunities Workshop
- Invited speaker: Professor Mary McNamara,
Head of the Graduate Research School, TU Dublin
- Postgraduate panel: Clodagh King Dundalk IT , Michela Caprani GMIT
and Adarsh Ananthachar CIT

SURE2020 Detailed Virtual Conference Schedule

9.00 – 9.30	Zoom Registration		
9:30 – 9:50	Opening Ceremony		
9.30 – 9.35	Opening by Ciaran O’Leary, Chair of the SURE Network (session chair)		
9:35 – 9:45	Address by Minister for Further and Higher Education, Research, Innovation and Science, Simon Harris		
9:45 – 9:50	Launch of the SURE Network National Student Survey, Dr Therese Montgomery , Chair of the SURE Network Curriculum Committee.		
9.50 -10.10	CIT Keynote 1: Mary Good , COO erican Chamber of Commerce, CIT Graduate		
<i>Student Presentations:</i>	Oral Presentations in Three Streams/breakout rooms		
10.10 -11.30	Analytical, Environmental and Pharmaceutical Science - CIT	Health Science and Nutrition - TU Dublin	Biological, Sport, Computing, Mathematical and Physical Sciences - GMIT
	Chair: Dr Eileen O’Leary	Chair: Dr Liz O’Sullivan	Chair: Dr Orla Slattery
10:10	1.1 Influence of light-emitting diodes (LEDs) and nitrogen enrichment on eicosapentaenoic acid (EPA) and fucoxanthin biosynthesis in the marine diatoms <i>Stauroneis</i> sp. and <i>Phaeodactylum tricornutum</i> , by Tommy Conlon (Institute of Technology, Sligo), Nicolas Touzet	2.1 Muscle strength in bulatory oncology patients and its relationship with quality of life, by Niamh O’Callaghan (Institute of Technology, Sligo), Laura Keaver, Aoibheann O’Sullivan, Catherine McHugh	3.1 Use of TRFLP as a Method to Examine Microbial Diversity in Different Soil Types, by Aoife Mulry (Athlone Institute of Technology), Siobhán Kavanagh, Lauren Egan
10:20	1.2 The Impact of Organic Pollution on Benthic Macroinvertebrates, by Karen Johnston (Institute of Technology, Sligo), Paul Hamilton	2.2 How do men prepare for pregnancy? Views on preconception health and lifestyle practices in Ireland, by Sally Griffin (Cork Institute of Technology), Janette Walton	3.2 A Cyber Security Framework for Identifying Android Application Security Issues, by Timothy McCann (Technological University Dublin), Stephen O’Shaughnessy

10:30	1.3 Analysis of sunscreen, by Mary O'Donoghue (Waterford Institute of Technology), Sheila Donegan	2.3 Validation and Interpretation of PD-L1 (SP142) in Triple Negative Breast Cancer, by Arianna Raso (Technological University Dublin), Kathleen Brosnan, Colm Buckley, Marie Staunton	3.3 Affine Term Structure Models, by Enda Flynn (Technological University Dublin), Stephen O'Sullivan
10:40	1.4 Synergistic Effect of Cold Atmospheric Plasma and Gold Nanoparticles on Cancer Cells, by Yamsel Barandino (Technological University Dublin), James Curtin	2.4 Investigation of the effect of timing of caffeine consumption on sleep quality of male students, by Niamh Donnellan (Athlone Institute of Technology), Geraldine Cuskelly	3.4 The Knowledge and Perceptions on Parents of Overtraining in Youths, by Rebecca Phelan (Institute of Technology, Sligo), Sasirekha Palaniswamy
10:50	1.5 MinION Sequencing of PASTeurised Milk (M.I.S.P.A.M.), by Emma Browne (Athlone Institute of Technology), Dawn Howard	2.5 Adherence, Impact and Challenges of Physical/Social Distancing during the COVID-19 crisis in Ireland, by Shauna Maloney (Institute of Technology, Sligo), Richéal Burns	3.5 Microbial fuel cells (MFCs): A study of microbial diversity on efficiency of power outputs from MFCs, by Lauren Egan (Athlone Institute of Technology), Siobhán Kavanagh
11:00	1.6 Investigation of chlorine free detergents in food: Using the dairy industry as a knowledge model, by Bevan (Cork Institute of Technology), Brose Furey, Michael McAulliffe	2.6 An investigation of relationship between habitual physical activity levels and cardiovascular disease risk factors, by Kate Kinsella (Technological University Dublin), Oscar MacAnaney	3.6 The Future of Manufacturing: Validating the use of a Digital Twin for a Drug Manufacturing Process, by Peter McSweeney (Cork Institute of Technology), Craig Murphy
11:10	1.7 Chemical characterisation of finished cosmetic products using spectrophotometric instrumentation, by Tamara Jordan (Galway-Mayo Institute of Technology), Eadaoin Tyrrell	2.7 An Investigation of the Perceived Health Benefits, Self-Reported Effects on Physical Activity Behaviour and Main Uses of Wearable Fitness Trackers: A Cross-Sectional Study, by Ellie Mc Donnell (Institute of Technology, Sligo), Azura Youell	3.7 Ecotoxicology studies on recycling derived fertilisers using nematodes as environmental indicators, by Andrew King (Institute of Technology, Carlow), Thomais Kakouli-Duarte, Anna Karpinska

11:20	1.8 Exosomes as Smarter Drug Delivery Vesicles, by Claire Healy (Technological University Dublin), Gordon Cooke	2.8 Dietary intake and knowledge of EPA and DHA omega-3 fatty acids on a sample of Irish women: results from a preliminary study, by Rachel Reidy (Athlone Institute of Technology), Aine O'Connor, Sharon Murtagh	3.8 Computational screening for potential inhibitors of SARS-COV-2 Main Protease, by Margaux Labrosse (Technological University Dublin), James Curtin, Gemma Kinsella, Ajay Pal, Julie Mondala
11:30	Voting ends for The SURE2020 Audience award for Best Science Communicator		
11:35 – 12:00	Break		
12:00 – 12:20	GMIT Keynote 2: Dr Ian O'Connor , Senior Lecturer and Marine Scientist, GMIT Chair: Dr Cormac Quigley		
12.20 – 13.00	Poster Sessions in Three Streams		
	Analytical, Environmental and Pharmaceutical Science - CIT	Health Science and Nutrition - TU Dublin	Biological, Sport, Computing, Mathematical and Physical Sciences - GMIT
	Chair: Dr Janette Walton	Chair: Dr Alan Casey	Chair: Dr John Healy
	1.1 "Accidental" quinoline/quinolone products from the syntheses of benzodiazepines: an exploration of the chemistry and interpretation of their mass spectra, by Michaela Larkin (Institute of Technology, Sligo), Geraldine Dowling, Pierce Kavanagh	2.1 Factors affecting willingness to consume proteins from sustainable sources, by Aoife Fitzpatrick (Institute of Technology, Sligo), Maria Dermiki	3.1 Micronutrient Intake of League of Ireland Soccer Players, by Aiveen Connolly (Institute of Technology, Sligo), Edwenia O'Malley
	1.2 Evaluating the potential cholinesterase inhibitory effect of crude extracts from native Irish algae species, by James Blee (Institute of Technology, Sligo), Owen Kenny, Paul Higgins	2.2 Investigation of the antimicrobial properties within the dynamic environment of homemade kombucha which may affect human health, by Fiona O'Mahony and Niamh Ring (Cork Institute of Technology), Brigid Lucey	3.2 An Investigation into the Hydration Status and Practices of Elite Soccer Players and the Efficacy of Individually Tailored Post-Exercise Rehydration Plans, by Ashleigh Mortimer (Institute of Technology, Sligo), Azura Youell

<p>1.3 The determination of cannabidiol and cannabidiolic acid in CBD products: Is Gas Chromatography - Mass Spectrometry a suitable analytical platform?, by Shannon Inigo (Institute of Technology, Sligo), Geraldine Dowling, Pierce Kavanagh</p>	<p>2.3 Physical activity and weight status in relation to the home environment on 5-year old children in Ireland: A descriptive analysis of the Growing Up in Ireland Infant Cohort Wave Three, by Aoife McGovern (Technological University Dublin), John Kearney, Richard Layte</p>	<p>3.3 To Measure Physical Activity and Sedentary Behavior of Students, by Ciara Treanor (Institute of Technology, Sligo), Joanne Regan</p>
<p>1.4 Development of a food product from carrot waste, by Ciara Mannion (Institute of Technology, Sligo), Maria Dermiki</p>	<p>2.4 A Review of the Adherence of Online Retailers to the International Code of Marketing of Breast-Milk Substitutes (the Code) and Irish legislation Concerning the Sale of Formula Milks, by Isha Sant (Technological University Dublin), Elizabeth O'Sullivan</p>	<p>3.4 An investigation of the kinematic properties of resisted sprinting (RS) under different loading conditions, by Lorcán Mason (Athlone Institute of Technology), Ciarán Ó Catháin, David Mannion, Katja Osterwald</p>
<p>1.5 A Comparison of Runs of Homozygosity Across 14 Populations from the 1,000 Genomes Project, by Eimear Looby (Cork Institute of Technology), Deirdre Purfield</p>	<p>2.5 A Study of the Association Between Dietary Assessments and Dietary Screening Tools in Investigating Nutritional Quality and Disease Risk, by Rosemary Cushion (Technological University Dublin), Mairead Stack, Machteld van Lieshout</p>	<p>3.5 The Effect of Post Activation Potentiation Exercises (Depth-Jump vs. Countermovement Jumps) on Wingate Anaerobic Performance in Collegiate Athletes, by Rory Doyle (Athlone Institute of Technology), Kris Beattie</p>
<p>1.6 The Effect of Atmospheric Pollutants on Pollen Grains – with particular emphasis on Hedera helix (ivy), by Aoife McMullin (Institute of Technology, Sligo), Paul Hamilton</p>	<p>2.6 An Audit of Marketing Legislation of Complementary Foods, by Emily Hunt (Technological University Dublin), Aileen Kennedy</p>	<p>3.6 Physical Activity Promotion and Referral on Healthcare Professionals for Clinical Populations, by Aideen Fitzsimmons (Athlone Institute of Technology), Clare Mc Dermott, Eimear Finnegan, David Murray</p>

<p>1.7 Bacterial Biofilms - A cause of chronic infections , by Sophie Shannon (Technological University Dublin), Emma Caraher</p>	<p>2.7 Drop Out from Phase IV Community-Based Cardiac Rehabilitation Programme; Rates and Reasons, by Serena Wynne (Institute of Technology, Sligo), Joanne Regan</p>	<p>3.7 Female Perspectives Regarding Resistance Training, by Shauna Bennett (Institute of Technology, Sligo), Azura Youell</p>
<p>1.8 Synthesis of pH-sensitive hydrogels for the incorporation and targeted release of folic acid, by Ailise Keating (Athlone Institute of Technology), Patricia Heavey, Clement Higginbotham</p>	<p>2.8 Children's Perceptions of Health and Wellness in A Primary School Setting, by Eva Capasso (Institute of Technology, Sligo), Margaret McLoone</p>	<p>3.8 The Effect of Land Management on Raw Milk Composition and Quality in Organic and Conventional Dairy Farms, by Chloe Dreaper Eyre (Athlone Institute of Technology), Sile O'Flaherty</p>
<p>1.9 Paracetamol Overdose and Poisoning Cases in Ireland and the UK: Is There a Growing Problem?, by Clare McKernan (Cork Institute of Technology), Anne Ward, Lorraine Endersen</p>	<p>2.9 Investigating the relationship between Aortic and Brachial blood pressure and cardiovascular risk factors in healthy adults, by Aoife Kennedy (Technological University Dublin), Oscar Mac Ananey, Aoife Kennedy, Oscar Mac Ananey</p>	<p>3.9 Gym-Eye - A Risk Detection System for Gym Environments, by Carl Brady (Technological University Dublin), Simon Mc Loughlin</p>
<p>1.10 The making of compost: the significance of the carbon/nitrogen ratio, by Oskar Pestka (Institute of Technology, Carlow), Carloalberto Petti</p>	<p>2.10 The evidence behind calorie posting as a strategy for behavioural change, by Aoife Corcoran (Cork Institute of Technology), Laura Kehoe, Brendan Brosnan</p>	<p>3.10 An investigation into the effectiveness of the design and placement of thirty-nine 'Bee hotels' on the Waterford Greenway as nesting aids for native solitary bee species, by Sean Keane (Waterford Institute of Technology), Yvonne Grace, Cara Daly</p>

1.11 An investigation into the development of different gel matrices incorporated in Matrix Assisted Laser Desorption/Ionisation (MALDI) by organic synthesis , by Fox Fallon (Galway-Mayo Institute of Technology), Cormac Quigley	2.11 The Determinants of Fast Food Consumption, by Laoise Quinn (Institute of Technology, Sligo), Irina Uzhova	3.11 The use of hemp protein hydrolysate as an antimicrobial agent to extend the shelf life of minced meat, by Robyn Lockhart (Institute of Technology, Sligo), Maria Dermiki
1.12 Method Development and Validation of a Gas Chromatographic Method for the Detection of Solvents in Commercial Screen Wash, by Nicole Meany (Cork Institute of Technology), Grainne Conneely		
1.13 Optimisation of the Utilisation of Immobilised Bead Technology for the Production of Ethanol: Batch versus Continuous Feeding Regimes, by Gavin Murray (Cork Institute of Technology), Caroline O'Sullivan		

13:00 – 14:00

Lunch and Poster Session.Posters available to view online at <http://sure-network.ie/conference/posters/>

14.00 – 14.10

Voting ends for SURE2020 Audience award for Best Scientific Poster

14.10 – 14.30

TU Dublin Keynote 3: Prof. Paula Bourke, University College Dublin, DKIT Graduate
Chair: Dr Cormac Quigley

14:30 – 15:00

Virtual Prize Presentation chaired by Ciaran O'Leary, Chair of the SURE Network
Conference prizes:

SURE Network Award for Best Scientific Poster

SURE2020 Audience award for Best Scientific Poster

The SURE Network Award for Best Oral Presentation

The SURE2020 Audience award for Best Science Communicator

14:30	Dr Barry O'Connor, President of Cork Institute of Technology presents awards for the Analytical, Environmental and Pharmaceutical Science Stream
14:40	Dr Orla Flynn, President of Galway-Mayo Institute of Technology presents awards for the Biological, Sport, Computing, Mathematical and Physical Sciences stream
14:50	Prof David FitzPatrick, President of TU Dublin presents awards for the Health Science and Nutrition stream
15:00 – 15:05	Update from SURE Network Undergraduate research journal SURE-J by SURE-J editor Dr. Barry Ryan
15:05 – 15:10	Update from the SURE Network National Student Survey by chair of the SURE Network Curriculum Committee Dr. Therese Montgomery
15:10 – 16:00	<p>Postgraduate Opportunities Workshop, chair: Dr. Therese Montgomery</p> <p>Invited speaker :</p> <p>Professor Mary McNamara, Head of the Graduate Research School, TU Dublin.</p> <p>Title of talk: 'Starting Your Career in Research'</p> <p>Postgraduate Panel: Clodagh King Dundalk IT, Michela Caprani GMIT and Adarsh Ananthachar CIT</p>

SURE2020 Keynote Profiles



Keynote 1 CIT:

Mary Good is Chief Operating Officer (COO) with the American Chamber of Commerce which is the leadership voice of US business in Ireland. Prior to this, Mary held numerous positions within PepsiCo, including Global Vice President Manufacturing, VP Global Technical Services, and several Senior Director roles working across Europe and Sub Sahara Africa. Mary has a Degree in Analytical Chemistry (BSc) from CIT, a Master's in Business (MBA) and currently in her final year of doing a Masters in Personal & Management Coaching in UCC. Mary is

passionate about promoting STEM and the opportunities it can bring. Mary also is on the UCC IGNITE Advisory Board.



Keynote 2 GMIT:

Dr Ian O'Connor is a marine biologist with a broad interest concerning organisms' responses to natural and anthropogenic stressors, from invertebrates to fish, seabirds and mammals. Since his appointment in 2004, he has collaboratively and individually secured > €20 million in research funding. Developed the internationalisation of postgraduate teaching and research within GMIT through participation in Erasmus Mundus Joint Doctoral Programmes, Erasmus+ Joint Master programmes and Erasmus+ Key Action 2 Capacity Building

Programmes. He has supervised >20 research postgraduate students to completion and is currently supervising 4 PhD students and two postdoctoral scientists. He currently works in the Graduate and Professional Development Dept within GMIT devising new programmes with industry and international partners.



Keynote 3 TU Dublin:

Paula Bourke is a Professor in the UCD School of Biosystems and Food Engineering, a Conway Institute Research Fellow and a member of the UCD Institute of Food and Health. She studied as an undergraduate in Dundalk Institute of Technology. She graduated from the University of Limerick in 2001 with a PhD in microbiological safety of novel non thermal processing technologies. During her time as a post-doctoral researcher at University of Limerick and as an Arnold Graves Research Fellow at DIT, she researched both thermal and non-thermal processing

and their interactions with food borne pathogens and resistance mechanisms.

Her research is primarily in the areas of sustainable processing innovations and novel antimicrobial technologies. She has a strong interest and research cross over to bio-medically relevant issues including infection prevention and control and Biofilms. She collaborates widely and has been successful in gaining funding awards at a national and international level.

Postgraduate Opportunities Workshop, Invited Guest Speaker:

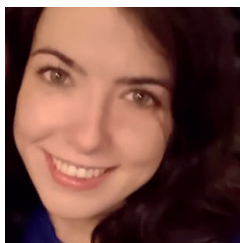


Professor Mary McNamara,
Head of the Graduate Research
School, TU Dublin

Title of Talk: 'Starting Your
Career in Research'.

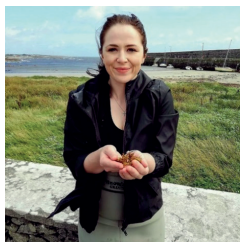
Postgraduate panel – A five minute
snapshot of 'A day in the life' of three
different postgraduate researchers
pursuing PhDs in each of our three SURE
Conference host institutions (TUDublin, CIT
and GMIT), followed by an open questions
and answer session, led by invited guest
speaker Professor Mary McNamara.

SURE2020 Postgraduate Speaker Profiles



Dundalk IT: Clodagh King

Clodagh King is in the second year of her PhD in Dundalk Institute of Technology (DkIT), under the supervision of Dr. Siobhán Jordan, Dr. Caroline Gilleran Stephens and Dr. Joseph Lynch. Clodagh joined the project (Agcumulate: A Study on the Accumulation of Microplastics in Soils and Terrestrial Ecosystems) in September 2019 after graduating with a BSc (Hons) in Environmental Bioscience, also from DkIT. The focus of the PhD is on the pollution characteristics of microplastics found in farmland soils across Ireland.



GMIT: Michela Caprani

Michela Caprani, is a PhD student in the Marine Freshwater Research Unit (MFRC) at Galway-Mayo Institute of Technology (GMIT) under the supervision of Dr. Orla Slattery, Dr. Joan O'Keeffe and Dr. John Healy. Her current PhD research involves the isolation and characterization of Antimicrobial Peptides (AMPs) from seaweed using Bioinformatics 0o analysis. Before beginning her doctorate at GMIT, she completed a BA in Nutraceuticals for Health and Nutrition in Technological University Dublin (TU Dublin). Throughout her graduate education, she has

worked on projects investigating the effects of seaweed on fatty acid profiles in bovine milk and novel purification and nutraceutical screening of antioxidant peptides from microalgae, *Arthrospira platensis*.



CIT: Adarsh Ananthachar

Adarsh received his Bachelors in Physics from Jain University in 2016 and Masters in Photonics from Department of Atomic and Molecular Physics, Manipal University in 2018 from India. Adarsh has always been interested in the fundamental sciences and is an avid astronomer who has observed more than 400 deep sky objects. As part of his graduate course, he completed his Master Thesis – "Characterisation of Photonic Crystal Cavities" under the supervision of Dr Liam O'Faolain in 2018. He is currently in the 2nd year of his PhD under the

supervision of Dr Liam O'Faolain in the Nanophotonics group, Centre for Advanced Photonics and Process Analysis (CAPPA) at Cork Institute of Technology and Tyndall National Institute. His research interests include, Silicon photonics, Nanofabrication and Optoelectronics and he is involved in the design and fabrication of nanophotonic devices.

SURE2020 Sponsors

The Sure Network would like to thank:



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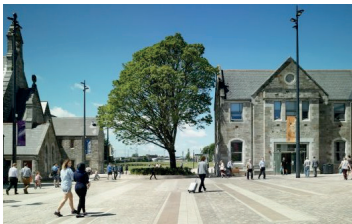
Medtronic

SURE 2020 Book of Abstracts (Oral Presentations)

Stream 1: Analytical, Environmental and Pharmaceutical Science



Stream 2: Health Science and Nutrition



Stream 3: Biological, Sport, Computing, Mathematical and Physical Sciences



Abstracts: Analytical, Environmental and Pharmaceutical Science

1.1 Influence of light-emitting diodes (LEDs) and nitrogen enrichment on eicosapentaenoic acid (EPA) and fucoxanthin biosynthesis in the marine diatoms *Stauroneis sp.* and *Phaeodactylum tricorutum*, by Tommy Conlon (Institute of Technology, Sligo), Nicolas Touzet

Microalgae represent a renewable source of high-value compounds with applications in industrial sectors such as pharmaceuticals, human nutrition and bioenergy. The identification of cultivation parameters that augment high-value metabolite biosynthesis is necessary for the valorisation of microalgae-based biorefinery. The effect of cultivation conditions on productivity and metabolite biosynthesis is species-specific. Therefore, it is essential to establish optimum conditions that enhance key metabolite production in novel strains isolated via biodiscovery missions. The present study investigated the impact of light-emitting diode (LED) wavelength variation and nitrate supplementation on the ability of the novel marine diatom *Stauroneis sp.* to biosynthesise EPA and fucoxanthin, by comparison to the model diatom species *Phaeodactylum tricorutum*.

In the case of *P. tricorutum*, white light and threefold nitrate cultivation returned the highest EPA ($9.4 \pm 0.7 \text{ mg g}^{-1} \text{ DW}$) and fucoxanthin ($9.5 \pm 1.4 \text{ mg g}^{-1} \text{ DW}$) yields. For *Stauroneis sp.*, green light with nitrate supplementation promoted EPA accumulation returning $3.1 \pm 0.3 \text{ mg g}^{-1} \text{ DW}$ while red light with nitrate supplementation significantly enhanced fucoxanthin production (returning $8.8 \pm 1.7 \text{ mg g}^{-1} \text{ DW}$). Comparing the novel and model species, *P. tricorutum* was significantly more productive () in relation to EPA biosynthesis. However, there was no significant difference (in relation to fucoxanthin production. The present study identified red light with nitrate supplementation as a promising upscaling strategy for fucoxanthin biosynthesis using the novel indigenous Irish marine microalga, *Stauroneis sp.* with potential applications in the sustainable formulation of functional foods or as an ingredient in animal feeds.

1.2. The Impact of Organic Pollution on Benthic Macroinvertebrates, by Karen Johnston (Institute of Technology, Sligo), Paul Hamilton

Monitoring the organic pollution levels in freshwater sources such as rivers and lakes is vital due to the relatively small amount present on Earth and the many different areas where freshwater is essential. The Copper river was assessed regarding its Q rating, the physicochemical parameters and possible microplastic ingestion by freshwater shrimp.

The Copper river was found to have a Q3 rating, corresponding to a moderate level of organic pollution, which agrees with the findings of a 2016 Ecofact report on the same river. According to the EPA, 12% of Sligo rivers were moderately polluted in 2018. This rating was determined by sampling the benthos and analysing the species and their relative abundances to each other present in the river.

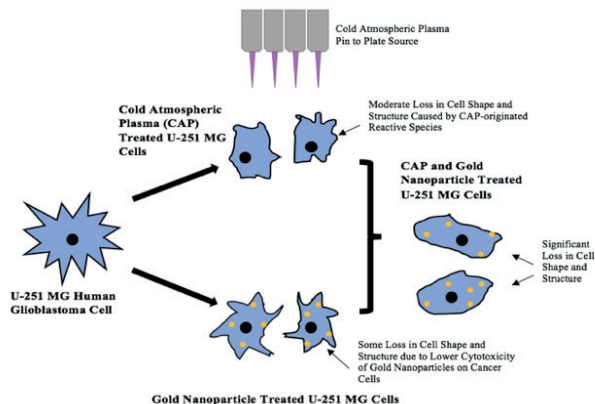
The physicochemical parameters, measured using either a dissolved oxygen, conductivity or pH meter, support this rating, particularly the dissolved oxygen and conductivity as they were lower than they would be in an unpolluted river.

Possible microplastic ingestion was investigated using a method described in "Microplastic Ingestion by Riverine Macroinvertebrates" (Windsor, Tilley, Tyler, & Ormerod, 2019). This analysis was inconclusive due to time restraints. However, many different fibres were found, and it is likely that some of these fibres were ingested as they were discovered with pieces of shrimp tissue attached. There is a strong possibility that some of these are microplastic fibres due to their smooth, linear appearance under the microscope. More research is required in this area to further highlight the effect of microplastic pollution on riverine benthos.

1.3. Analysis of sunscreen, by Mary O'Donoghue (Waterford Institute of Technology), Sheila Donegan

This project evaluates the UV spectrophotometric behaviour of sunscreen and UV filters in sunscreen products. The experiments in this project were carried out in the solvent 2-propanol and the samples were analysed in a Cary 100 UV spectrometer. The effect of SPF factor on absorbance and the effectiveness of sunscreen products which are past their use by date were investigated using UV/Vis analysis. It was determined that there is a general increase in absorbance with increasing SPF factor, this can be further interpreted that higher SPF values give greater effective protection from UV rays. Experimental analysis of different brands of the same sunscreen SPF value was carried out for a range of products in different price ranges. The sunscreen brand 'Nivea' gave the greatest effective protection from UV rays, this sample displayed high absorbance in a wide range of UV rays and this is true for all SPF values for this brand. The higher price for this product is justified by the greater absorbance over UVA, UVB and UVC rays. Expired sunscreen products were compared with current in date commercial products. A notable decrease in absorbance in lower wavelengths (UVC and UVB) for the out of date versus the in date product was discovered. Analysis of literature has shown that UV filters displayed degradation due to ageing and photo degradation which greatly decrease the sunscreen's ability to absorb. It can be concluded that replacement of sunscreen products according to their 'best by' date is extremely important for effective sun protection..

1.4 Synergistic Effect of Cold Atmospheric Plasma and Gold Nanoparticles on Cancer Cells, by Yamsef Barandino (Technological University Dublin), James Curtin



Glioblastoma multiforme (GBM) is a highly invasive and aggressive grade IV malignant brain tumour that accounts for 43% of all brain cancer cases in Ireland.^[1] Current treatments involve surgical resection, radiotherapy, and chemotherapy which currently allow for an average survival rate of 15 months.^[2] For this reason, new methods of treatment are crucial to prolong survival rates and combat this illness. Gold nanoparticles (AuNPs) are emerging as favourable vehicles in cancer research for targeted drug delivery and induction of apoptosis. Cold atmospheric plasma (CAP), a non-thermal ionised gas, has been observed to produce a synergistic cytotoxic effect with AuNPs on cancer cells.^[3] The aim of this study is to investigate if the combination of cold atmospheric plasma and gold nanoparticles can significantly increase the cytotoxicity of 2D and 3D cells of the U-251 MG human glioblastoma cell line. The objectives are to analyse the effect of different exposure times of pin-to-plate CAP, to evaluate the effect of 20nm AuNPs at various concentrations, and investigate their combined effect on 2D and 3D U-251 MG cells. Consequently, significant cell death was observed in 2D cells treated with 160 seconds of CAP and 200µg/mL AuNPs in which the IC_{50} range (95% confidence interval) was 66.8 to 117.0 compared to the standalone CAP treatment IC_{50} range of 169.8 to 1412. This data indicated that a combined treatment of pin-to-plate CAP and 20nm AuNPs had a synergistic effect that notably enhanced the cytotoxicity of 2D and 3D U-251 MG cells.

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1.5 MinION Sequencing of Pasteurised Milk (M.I.S.P.A.M.), by Emma Browne (Athlone Institute of Technology), Dawn Howard

The bacterial communities of pasteurised milk samples were identified using Oxford Nanopore MinION sequencing. This third generation sequencer has the potential to be used in the food industry for foodborne pathogen outbreaks and food adulteration events. The aim of this study was to assess the efficiency of the MinION to sequence the bacterial communities in commercial pasteurised milk samples, as well as its capability in detecting the difficult to culture *Mycobacterium avium subsp. paratuberculosis* (MAP).

Four brands of pasteurised milk were bought in local supermarkets. Microbial DNA was extracted using the DNeasy PowerSoil™ and DNeasy PowerFood™ Qiagen kits. DNA quality and quantity were determined using the Qubit 3 fluorometer, agarose gel electrophoresis and UV spectrometry. Targeted multiplex amplicon sequencing of the 16S rRNA gene was carried out using the MinION sequencer.

450,780 reads were generated and 22% of these were basecalled using the MinkNOW software. 103,347 reads were classified by BLAST analysis against the NCBI 16S bacterial database using Epi-2-Me, which allowed for assessment of the bacterial community of three of the milk samples. Taxonomic trees were created for each of these three samples as well as for a pooled sample.

The 5 most abundant genera classified were *Pseudomonas*, *Bacillus*, *Serratia*, *Paenibacillus*, and *Lactococcus*. These are commonly found in raw milk, and genera were expected and comparable to other studies. MAP was not detected in the classified reads. The pipeline developed using the MinION was time and materials efficient and can allow the study to be expanded to include pasteurised milk samples from different regions in Ireland.

1.6 Investigation of chlorine free detergents in food: Using the dairy industry as a knowledge model, by Amber Bevan (Cork Institute of Technology), Ambrose Furey, Michael McAulliffe

Chlorine detergents have been used universally on dairy farms and food processing plants as a method of disinfection of equipment. Although chlorine detergents are an effective means of disinfection and lowering the total bacterial count (TBC's) in milk, over the past few years there has been a growing concern for the amount of chlorine residues in milk. Chlorates (ClO_3^-) enter the food chain from degradation of these chlorine detergents. This is a concern for the Irish Dairy industry as excessive residue levels of chlorates have an impact on dairy products being exported, for example, as lactic butter or infant milk formula. As a result, the Board of Ornuá (The Home of Irish Dairy) passed a resolution in 2018, to remove all chlorine-based detergents from the dairy industry by the end of 2020. There are now a wide range of chlorine free (CF) detergents available. The study showed that spectroscopic techniques (mid-infrared (ATR-FTIR) spectroscopy and Raman spectroscopy) could be used as quality control tools to identify phosphate (PO_4^{3-}) compounds present in CF detergents depending on the concentration of the detergent used. These spectroscopy techniques can be used as quality control tools for the identification of phosphate residues in milk therefore assisting the dairy and food industry in screening for and reducing phosphate residues in dairy products

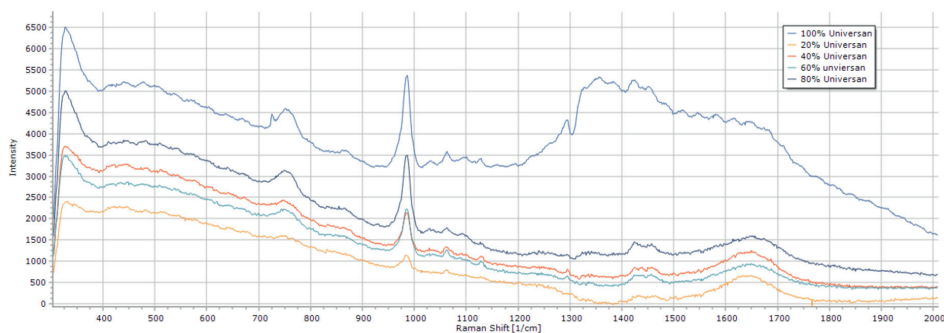


Figure 1. Raman spectra using Flipper 785nm using glass vials containing samples. The Raman shift can be seen for each CF detergent dilution (100-20%) from 950-1000 cm^{-1} .

1.7 Chemical characterisation of finished cosmetic products using spectrophotometric instrumentation, by Tamara Jordan (Galway-Mayo Institute of Technology), Eadaoin Tyrrell

Polymeric complexes are abundantly used in cosmetics. Owing to their versatile nature, polymers help ensure product structure, improve skin adhesion and compliment metal oxide pigments to enhance the aesthetic appearance of the product. FDA approved metal oxide pigments, as well as, wax and oil compounds are also commonly incorporated into cosmetic formulations (Patil, 2013).

However, heavy metal contaminants pose a risk to consumers and are often found in counterfeit cosmetics. The use of same can lead to adverse health effects (Rock, 2019). Therefore, it is of utmost importance that the composition of cosmetic products is well established in order to ensure quality and safety of same.

The aim of this project was to conduct research on the main components in makeup cosmetics. Several techniques were chosen to gather information and aimed to qualitatively and quantitatively assess these major elements, concluding their importance and contribution to product quality and safety.

In this report, a variety of cosmetic samples were analysed using selected methodologies, including Thin Layer Chromatography, Refractive Index, Flame Atomic Absorption Spectroscopy, Graphite Furnace Atomic Absorption Spectroscopy, and Fourier Transform Infrared Spectroscopy. Testing was conducted in triplicate and a t-test statistical analysis of the results was carried out to ensure the standards were stable over the course of testing.

The analysis established no heavy metal contaminants were present, and so the products were deemed safe for use.

This abundance of the compounds identified underscores the importance of their inclusion in the samples, helping to ensure product quality and safety.

Table 1: Summary of results obtained from various test methods used, detailing quantities of pigments used, and major polymeric complexes included.

Brand	Sample Type	Rf Values	Refractive Index	Metal Oxide Pigment (mg/kg)		Polymeric Compounds
				Fe	Ti	
Isa Dora	Lipstick	0.97	1.3872	-	9.20	PEG-8, Carmine
Flormar	Lipstick	0.97	1.3939	15.64	14.90	PEG-8, Silica
Rouge A Levres	Lipstick	0.97	1.3872	63.27	87.41	PEG-8, Silica
Flormar	Lipstick	0.97	1.3437	0.63	82.54	PEG-8, Silica, Carmine
Flormar	Lipstick	0.98	1.3942	19.59	93.67	PEG-8, Silica
Flormar	Lipstick	0.96	1.3959	-	22.61	PEG-8, Silica, Polyurethane
Flormar	Eye Shadow	0.97	1.3438	398.05	58.25	Polyurethane, Silica, Talc
Flormar	Blush	0.96	1.3437	525.45	18.78	Polyurethane, Talc
Gosh	Blush	0.96	1.3917	508.35	28.69	Polyurethane, Silica, Talc
Flormar	Bronzer	0.95	1.3418	341.86	24.56	Polyurethane, Silica, Talc

References

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1.8 Exosomes as Smarter Drug Delivery Vesicles, by Claire Healy (Technological University Dublin), Gordon Cooke

Introduction

Exosomes are extracellular vesicles of around 30-150 nm and produced by all cells. They are natural molecules and are used for communication between cells including cancerous cells. Exosomes are natural carriers of material such as DNA or RNA from cells, because of this they have recently been researched as drug delivery vesicles. Exosomes have good targeting abilities which improves the effect a cancer drug can have while reducing the problem of off-site toxicity

Method

Cells were sub-cultured at ~80% confluency and stored at 37°C with media appraisal every 3-4 days. The MTT assay (an abbreviation for the dye, which is utilised in the experiment, 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) is a cell viability assay. In this experiment it was used to observe the cytotoxicity of 6-thioguanine standards and drug loaded exosomes on cancer cell lines; T24 and MCF-7. The exosomes were loaded with drug by incubation and purified using an ExoSpin column. Post assay the absorbance values were read using a 96 well plate reader at 570 nm.

Results

From the MTT assay of the free drug it was determined that 100µM was the appropriate concentration to be loaded into exosomes. Although this is slightly higher than expected as the IC50 value of the drug is 10µM. The drug loaded exosome showed a significant drop in absorbance values when compared to free drug, which shows there was fewer viable cells in these wells.

Conclusion

Results show that drug loaded exosomes have more effect in killing both T24 and MCF-7 cells than free drug.

Abstracts: Health Science and Nutrition

2.1 Muscle strength in ambulatory oncology patients and its relationship with quality of life, by Niamh O'Callaghan (Institute of Technology, Sligo), Laura Keaver, Aoibheann O'Sullivan, Catherine McHugh

Muscle strength as a proxy of muscle function has been widely utilized in both clinical and epidemiological studies as a prognostic marker⁽¹⁾. The measurement of hand grip strength (HGS) is a reliable non-invasive test of muscle strength. The aim of this project is to investigate the HGS of ambulatory oncology patients and its relationship with QoL. This prospective cross-sectional study was conducted on ambulatory patients attending the oncology day ward and outpatient clinic in Sligo University Hospital (SUH). Ethical approval was granted from the research committee in SUH. The European Organisation for Research and Treatment of Cancer Quality-of-life Questionnaire Core 30 (EORTC QLQ-C30) was used to analyse QoL. HGS was performed using isometric dynamometry on the dominant hand and the highest value of three measures was analysed. HGS was categorized into normal HGS and $\leq 85^{\text{th}}$ percentile, based off percentile values presented in the Manual of Dietetic Practice⁽³⁾. The cohort ($n=160$) was predominantly female (58.1%), breast cancer was the most prevalent cancer type (30.6%) and the mean age was 63.2 ± 11.3 . In total, 51.9% had weak HGS and results indicated significant difference between HGS percentiles, ($p=0.00$). Weak HGS was significantly associated with poorer QoL ($p=0.03$), physical, role and emotional functioning ($p=0.01$) (One-way-ANOVA). Patients with weaker HGS experienced more symptoms such as fatigue, pain, appetite loss and constipation ($p < 0.05$). Results display how poor muscular strength impacts QoL in an ambulatory oncology setting. If routine screening of muscle strength was conducted in oncology patients, it could aid timely referral to support patients and combat the negative impacts on their future.

2.2 How do men prepare for pregnancy? Views on preconception health and lifestyle practices in Ireland, by Sally Griffin (Cork Institute of Technology), Janette Walton

Background & Objectives: The term preconception health can be defined as the health and lifestyle behaviours of women and fertile couples prior to pregnancy that optimize health and reduce adverse pregnancy outcomes. Growing evidence suggests several factors of men's health and lifestyle behaviours prior to conception influence conception and pregnancy outcomes. This includes diet, body size, stress, smoking and alcohol consumption. This project sets out to understand the degree of awareness regarding preconception health in men of child-bearing age in the Republic of Ireland. Men's opinions on preconception health, lifestyle modifications, current practices and sources of preconception information will be investigated.

Materials & Methods: This project is contributing to an ongoing study in Queens University Belfast (QUB). A quantitative, online questionnaire was developed by researchers in QUB using Qualtrics and distributed online. Questions relating to social demographics, child and pregnancy planning status, awareness of preconception health practices and sources of information were asked.

Results: 89 respondents completed the questionnaire, including 62 men and 27 women. As presented in Figure 1, men seem to have good awareness of preconception health but believe women hold a higher level of responsibility compared to men. There appears to be a disconnect between preconception perceptions and actual practices. Most preconception knowledge was found online but respondents would prefer if healthcare professionals provided guidance on preconception.

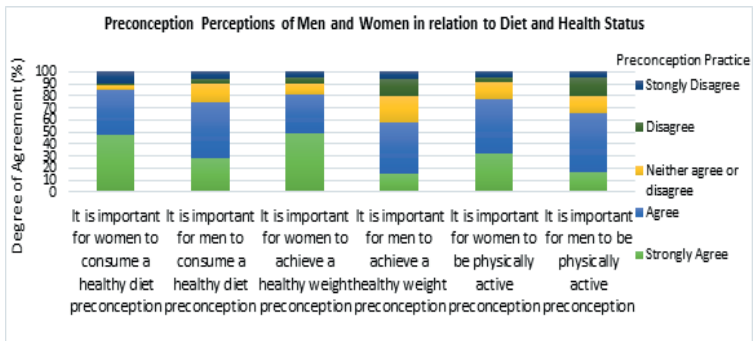


Figure 1: Preconception perceptions of men and women in relation to diet and weight status

Conclusions: More promotion of male preconception health and lifestyle requirements are needed to emphasize the male responsibility. The controversial question of who should provide this information needs to be established to avoid participants depending on online sources.

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2.3 Validation and Interpretation of PD-L1 (SP142) in Triple Negative Breast Cancer, by Arianna Raso (Technological University Dublin), Kathleen Brosnan, Colm Buckley, Marie Staunton

Breast Cancer is the most common occurring cancer worldwide and is the second leading cause of death by cancer in women (American Cancer Society, 2020). In particular, Triple Negative Breast Cancer (TNBC) is a highly aggressive subtype of breast cancer, with the highest metastatic potential and poorest clinical outcome due to the limited treatment options available (Denkert *et al.*, 2017). Following the promising results of the IMpassion 130 clinical trial, the PD-L1 inhibitor Atezolizumab has become of great interest for the treatment of TNBC (Schmid *et al.*, 2020). Atezolizumab acts by targeting PD-L1 receptors which are present on tumour cells (Figure 1).

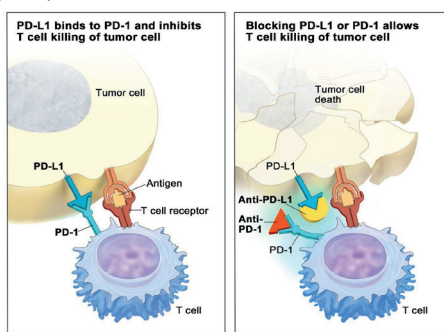


Figure 1: PD-1 to PD-L1 interaction between tumour cell and T-cell (National Cancer Institute, 2019).

This project is designed to validate the immunohistochemical VENTANA PD-L1 (SP142) Assay; to determine its ability to stain PD-L1 positive immune cells and describe its performance in terms of specificity and sensitivity. A total of $n=42$ TNBC samples were stained with the VENTANA PD-L1 (SP142) antibody. A group of $n=10$ of the total sample group were selected for interlaboratory comparison and interreader studies. Half ($n=21$) of the total sample population exhibited PD-L1 expression. The interlaboratory comparison study demonstrated high levels of sensitivity (100%) and specificity (75%). The reader precision showed high overall agreement (Overall percent agreement=100%).

As a result of the acceptable sensitivity and specificity levels which were observed, this assay will be used to identify TNBC patients who may benefit from Atezolizumab treatment.

References

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2.4 Investigation of the effect of timing of caffeine consumption on sleep quality of male students, by Niamh Donnellan (Athlone Institute of Technology), Geraldine Cuskelly

Introduction

Research suggests that excess caffeine intake results in poor sleep quality. The timing of caffeine intake is likely to be important in how it effects sleep. As caffeine is commonly consumed amongst students, this randomised controlled trial investigated the influence of the timing of caffeine consumption on the sleep quality of male students.

Methods

Screening questionnaires identified caffeine sources and time of consumption. Screening Questionnaires showed moderate caffeine consumption after 5pm, removing consumption after this, reduced chances of withdrawal symptoms. Participants were randomised to the experiment group (remove caffeine from their diet after 5pm for 3 weeks) or control group (continue their normal caffeine consumption). Sleep Quality was measured using PSQI. The primary outcome measure was the change in PSQI score in. A decrease in the PSQI means an improvement in sleep quality. Food diaries measured habitual caffeine consumption. The group means, standard deviations and medians were calculated.

Results

Sixteen male students completed the study. The mean sleep score in the intervention group (n=8) decreased from 8.11 ± 3.11 to 4.51 ± 2.81 . The mean score in the control group (n=8) decreased from 7.11 ± 1.12 to 6.51 ± 1.41 . The main sources of caffeine were found to be coffee, tea, soft drinks, energy drinks and chocolate. These items were consumed throughout the day.

Conclusion

The results of this study provided an insight into the sleep quality and the caffeine consumption habits of male students. Changes in PSQI scores suggest that restriction of caffeine consumption after 5pm has potential to improve the sleep quality of participants.

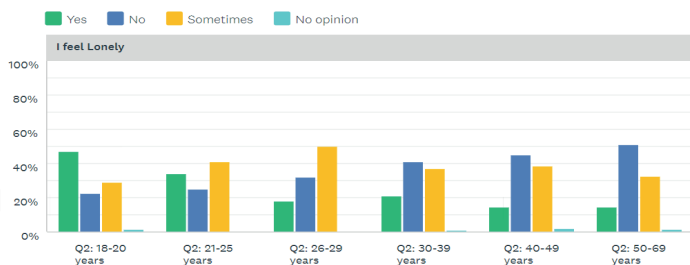
2.5 Adherence, Impact and Challenges of Physical/Social Distancing during the COVID-19 crisis in Ireland, by Shauna Maloney (Institute of Technology, Sligo), Richéal Burns

Background: On 15th April 2020, over 2 million detected cases worldwide and 150,836 deaths were reported due to COVID-19. On the 27th February the first case of COVID-19 presented in Ireland prompting the enactment of social distancing measures. Social distancing, also known as “physical distancing,” is a set of non-pharmaceutical measures taken to minimise contact with other individuals to decrease the spread of a contagious disease. It consists of maintaining a physical distance between people (*WHO, 2020*).

Objective: To understand the adherence, impact and challenges of Physical/Social distancing in Ireland during the COVID-19 crisis in Ireland during phase 1 lockdown.

Method: A cross-sectional online survey consisting of 57 questions on adherence, challenges and the impact of lockdown measures during phase 1 of easing COVID19 restrictions was developed adopting a mixed-methods approach. Piloting of the survey was undertaken across a range of relevant stakeholders. Recruitment of participants involved a targeted social media campaign and email notification to TD’s across Ireland. A total of 1107 surveys were attempted across the Republic of Ireland and 941 surveys were fully complete, representing an 85% completion rate.

Results: The results of this study show that Physical/Social distancing measures have many impacts on people’s lifestyles, mental health and stress levels; this varies by age, gender and employment status. Of particular concern approximately 3 in 4 of respondents aged 18-25 years reported to be “lonely” or “sometimes lonely”; a greater proportion compared to other age groups.



Conclusions: This study sought to understand the impact and outcomes of social distancing in Ireland and provides valuable evidence to consider in the future of government response planning.

2.6 An investigation of relationship between habitual physical activity levels and cardiovascular disease risk factors, by Kate Kinsella (Technological University Dublin), Oscar MacAnaney

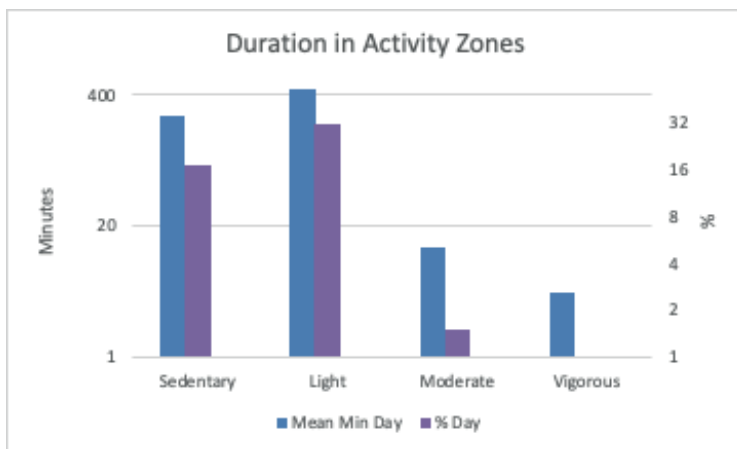
Background/Objectives: This study aims to observe habitual physical activity (PA) in individuals and investigate the relationship of regular PA as direct protective factor for noncommunicable diseases (NCDs) including cardiovascular disease (CVD).

Method: 77 subjects aged between 28-52 years participated in this observational study. Anthropometric measurements, blood, glycaemic and metabolic profiles were measured. PA was recorded using a triaxial accelerometer (RT3, Stayhealthy, USA) over 7 consecutive days. The arbitrary threshold for meeting WHO physical activity guidelines was 21.4mins.

Results: Females spent more time being sedentary ($p=0.049$). Subjects categorised as abnormal waist circumference (WC) spent more time being sedentary ($p=0.005$). Subjects categorised as normal WC spent more time being moderately active ($p=0.028$). Subjects categorised as healthy body fat percentage (BF%) spent more time being vigorously active ($p=0.005$). 26% of subjects met the WHO physical activity guidelines. More subjects with normal BF% met WHO guidelines ($p=0.02$). More subjects with normal fasting insulin and met with WHO guidelines ($p=0.04$). A larger number of subjects with abnormal LDL-C did not meet the WHO guidelines ($p=0.017$), compared to subjects with normal LDL-C.

Conclusion: Sedentary behaviour was associated with increased adiposity which is a risk factor in developing CVD. However, high levels of moderate and vigorous activity decreased body percentage, therefore it can be said PA can reduce risk factors associated with CVD. Further investigation needs to be conducted on the benefits of meeting WHO PA guidelines, as the arbitrary cut off of 21.4 min a day is questionable.

Figure 1: Absolute (min) and relative (%) time spent within activity thresholds



2.7 An Investigation of the Perceived Health Benefits, Self-Reported Effects on Physical Activity Behaviour and Main Uses of Wearable Fitness Trackers: A Cross-Sectional Study, by Ellie Mc Donnell (Institute of Technology, Sligo), Azura Youell

Purpose

The purpose of this study is to investigate the perceived health benefits of using wearable fitness trackers (WFT), the effects of a WFT on self-reported physical activity (PA) behaviour, the main uses of a WFT in the general population, including the features perceived as most beneficial, and to ascertain the frequency with which features are monitored.

Method

100 purpose designed questionnaires were circulated and 41 users and 22 non-users of WFTs with an average age of 29.4 ± 13.7 (\pm SD) years took part.

Results

The results indicated that 87.8% of respondents perceived that using a WFT would increase their PA levels and 90.2% perceived that using a WFT would improve their daily step count. The majority of participants (53.7%) checked WFT for feedback (excluding the time) several times a day. It was reported that 56.1% of users accessed the 'Steps' feature more than once a day and 31.7% of users checked 'Average Heart Rate' and 'Calorie Expenditure' daily.

Findings showed that: -

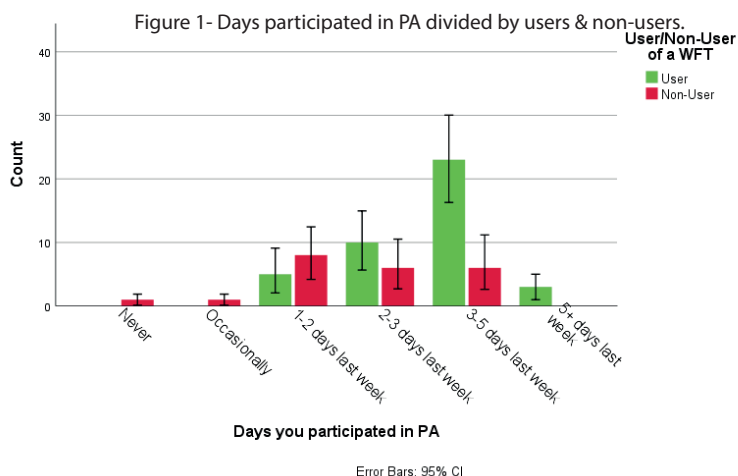
of Non-Users 3.2% (N=2) 'never' or only 'occasionally' participate in PA.

Users report a minimum of at least 1-2 days per week of PA.

The Majority of users (N=23) engaged in 3-5 days per week

Conclusion

Overall results suggest that WFTs are a useful tool for increasing PA levels in the general population as there was a significant association, PA, $\chi^2(1) = 8.731$, $p = .00$, between WFT use and amount of days a respondent participated in PA. The majority of participants reported their PA levels had increased after obtaining a WFT in comparison to prior to owning a WFT.

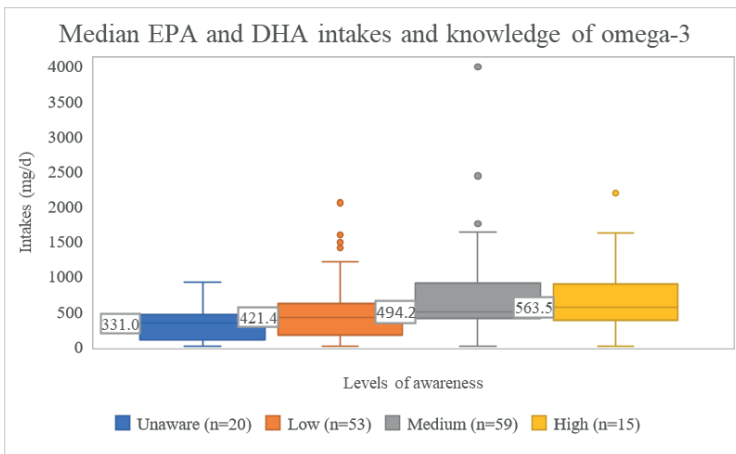


2.8 Dietary intake and knowledge of EPA and DHA omega-3 fatty acids among a sample of Irish women: results from a preliminary study , by Rachel Reidy (Athlone Institute of Technology), Aine O'Connor, Sharon Murtagh

Rationale: Heart disease is a leading cause of death among women (WHO, 2020). Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are long chain omega-3 polyunsaturated fatty acid (PUFA) with numerous health benefits including cardiovascular, brain and metabolic health (Maki et al., 2017; Alexander et al., 2017; McNamara et al., 2015; Kim et al., 2016). Irish women have inadequate intakes of EPA and DHA (IUNA, 2011; Leite et al., 2010), while uncertainty remains as to whether people are aware of PUFAs and their proposed health benefits. The present study aimed to determine knowledge and intake of EPA and DHA in women aged 41-65 years in Ireland.

Materials and Methods: A cross-sectional study (n=147) was carried out. Habitual dietary intake of EPA and DHA was assessed using a validated omega-3 Food Frequency Questionnaire (Shen et al., 2019). Total consumption of EPA and DHA was calculated from their intakes of seafood, supplements, and fortified foods. Knowledge of omega-3 PUFAs and their potential health benefits was assessed using a validated knowledge questionnaire (Roke et al., 2018). Nutritics software was used to calculate EPA and DHA intakes. Descriptive statistical analysis was carried out. Intakes of EPA and DHA (mg/day) were expressed as median intakes (IQR) and percentages not meeting recommendations were calculated.

Results: Estimated median intakes of EPA, DHA and combined EPA and DHA (mg/day) were: 169.5 (84.7-312.0), 290.6 (134.1-453.5), 460.1 (218.8-765.5) respectively. Approximately 36.1% of the sample did not meet daily EPA and DHA intakes of 400mg-600mg/d (FSAI, 1999), with 27% not meeting EFSA (2012) recommendations (≥ 250 mg/d). Approximately, 86.4% were aware of PUFAs and/or their proposed health benefits.



Conclusion: In this sample of Irish women a large proportion had adequate intakes and knowledge of omega-3's. Despite adequate omega-3 knowledge, a proportion of women consumed amounts lower than recommendations for CVD protection.

Abstracts:

Biological, Sport, Computing, Mathematical and Physical Sciences

3.1 Use of TRFLP as a Method to Examine Microbial Diversity in Different Soil Types, by Aoife Mulry (Athlone Institute of Technology), Siobhán Kavanagh, Lauren Egan

Microbial diversity plays a crucial role in maintaining productive soil, particularly the presence of Nitrogen fixing bacterial species (Bhattacharjee *et al.*, 2008).

This study aimed to investigate microbial diversity from forest, agricultural and peat soils using terminal restriction fragment length polymorphism (TRFLP). Microbial DNA was extracted from soil and the 16S rDNA region amplified using a 6-FAM fluorescently labelled primer. Resulting products were digested with both Hha1 and Msp1 restriction enzymes.

Difficulties generating PCR products due to presence of humic substances hampered the initial aim but TRFLP profiles were successfully generated from agricultural grassland soil (AGO), bog peat soil (BPS) and selected gram-negative bacterial isolates. The TRFLP results from soil samples were compared to results from bacterial isolates and an in-silico virtual TRFLP ladder, generated using 16S rDNA sequences from GenBank. The distribution and abundance of fragment lengths differed between the sites.

Bacterial diversity was estimated by abundance of terminal restriction fragments, indicating more diversity was present in BPS. The bacterial genera identified were associated with the nitrogen cycle. TRFs associated with *Azobacter*, *Rhizobium* and *Paracoccus* were common to both soil samples. TRFs associated with *Azobacter*, *Rhizobium* and *Paracoccus* were identified within AGO. TRFs associated with *Azobacter*, *Nitrosomonas*, *Nitrobacter*, *Nitrosococcus*, *Rhizobium* and *Paracoccus* were identified within BPS. TRFs were less successful from digests using restriction enzyme Msp1.

The research concluded that nitrogen fixing bacteria in BPS may not be associated with legume plants and found TRFLP is an effective but challenging method for generating microbial diversity profiles at a phylogenetic level (Dunbar *et al.*, 2000).

3.2 A Cyber Security Framework for Identifying Android Application Security Issues, by Timothy McCann (Technological University Dublin), Stephen O'Shaughnessy

This research presents an assessment of the current security posture of Android mobile gaming applications and investigates the security issues commonly found in these applications. Based on the assessment findings, a complete testing framework and methodology have been derived, based on security best practices, which can assist mobile developers in designing secure applications. The customised testing framework can be applied to any mobile application development. The Android mobile gaming market was selected for developing uses cases, due to 74.3% of mobile devices as of the year 2020 use the Android operating system and gaming apps have the largest user base on Android, with 21% of applications downloaded by Android users being mobile gaming applications. The framework is capable of assessing the Data Storage, Cryptography, Network Communications, Android Platform and Code Quality & Build Settings for each Android application tested. The results collected by this research show that 73% of mobile gaming applications tested contain at least one security issue. Figure 1 shows the distribution of each security issue category across the applications tested.

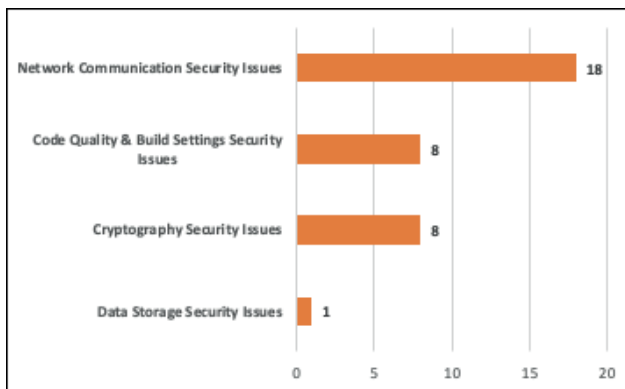


Figure 1. Distribution of application security issues

The assessment provided by this research has identified several categories of security issues commonly found in Android mobile gaming applications, such as publicly exposed databases, deprecated/misconfigured encryption algorithms and traffic being sent in cleartext. The framework can be used to help educate developers on the best practices for implementing security and user privacy protection into their mobile applications.

3.3 Affine Term Structure Models, by Enda Flynn (Technological University Dublin), Stephen O'Sullivan

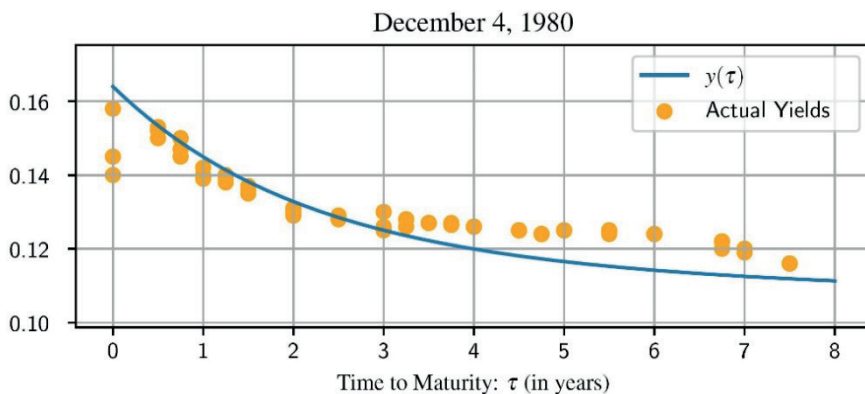
My research provides a comprehensive study of two Affine Term Structure Models (ATSMs). ATSMs are used to forecast bond yields, and hence derive the yield curve, based on observable economic data.

First, we introduce the concepts that are prerequisite to an understanding of ATSMs and proceed to an in-depth study of two common approaches to deriving the yield-to-maturity of a zero-coupon bond by implementing the Cox et al. (1985) model. These two approaches are the numerical methods of Duffie and Kan (1996) and Monte Carlo methods.

We then consider the more sophisticated model of Balduzzi et al. (1996) and consider the benefits of same in comparison to this first model. In our discussion, we detail our discovery of a published typo which is consistently reproduced in more recent sources.

In closing, we include a study of the shape of the yield curve and the factors necessary to accurately model same. Most substantially, a brief comparative study of the efficacy of the Cox et al. (1985) model and Balduzzi et al. (1996) is included. This follows the same approach as numerous published papers which seek to judge the usefulness of two different ATSMs.

The figure below demonstrates the yield curve resulting from one of my implementations using the approach of Duffie and Kan (1996). Note that this yield curve accurately fits the historical bond yields for U.S. treasury bonds issued in 1980 with maturities up to 8 years as expected from the results of Chen and Scott (2003).



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3.4 The Knowledge and Perceptions among Parents of Overtraining in Youths, by Rebecca Phelan (Institute of Technology, Sligo), Sasirekha Palaniswamy

Although participation in physical activity is imperative for good health in youths, previous research has indicated that some youths are carrying out excessive amounts for their age. As a result, **overtraining** is being acknowledged as an issue in youths today. As parents have an influence on their child's sports participation levels, their awareness of measures to avoid overtraining is imperative. This study aims to investigate the knowledge and perceptions that parents have on overtraining, which is yet to be determined.

100 parents participated in a cross-sectional study carried out using an online questionnaire with the aid of statements from exercise physiology books. The results were analysed using the computer statistics software SPSS.

The mean number of accurate responses was ($M=6.81$, $SD=2.586$). 66% of the sample identified that overtraining can result in decreased strength and fitness; 62% incorrectly believed that training will always produce performance improvements, highlighting a level of uncertainty. Parents accurately identified 61% of the associated symptoms of overtraining; 90% recognised the symptom of muscle soreness; less than half determined loss of appetite (20%) and frequent illness (36%) as symptoms. Most parents ($\geq 72\%$) correctly established avoiding large increases in training volume or intensity, sufficient diet and hydration and adequate rest periods as ways to reduce the risk of overtraining; while participation in multiple sports was less commonly identified as a preventative measure (24%). 66% of parents preferred a coach/trainer as a source of information for overtraining.

The results indicate that there are gaps present in knowledge and perceptions among parents on overtraining in youths. Increased awareness and targeted education are crucial to inform parents about this matter.

3.5 Microbial fuel cells (MFCs): A study of microbial diversity on efficiency of power outputs from MFCs, by Lauren Egan (Athlone Institute of Technology), Siobhán Kavanagh

MFCs are devices which can generate electricity by anaerobic fermentation of organic or inorganic matter from easily metabolized biomass. This study was in the area of Environmental Biotechnology, the main objective being to compare and contrast soil microbial populations in terms of power output.



Figure 1: The Mudwatt MFC that was used over the course of this study.

Initially a soil sample was sterilized and used as a matrix to absorb samples of wastewater, to examine if the microbes present were capable of producing electricity. As no energy production was observed it was decided to switch to soil samples from different locations.

Three different bacterial populations were examined from three different soil types; bog, agricultural and garden soil. These were examined for their power generating capability with the use of the Mudwatt MFC, mini-capacitors and LEDs. Power was measured in microwatts and measured over a seventeen-day period. Environmental factors were also tested over the course of this study, including; incubation times and amounts of free oxygen available.

TRFLP was used to characterise the three different bacterial populations. It was found that the greater the bacterial community, the more power that was generated.

It was determined over the course of this study that environmental factors, as well as microbial populations had a major effect on power generation in MFCs. The power output of the MFCs also greatly differed when incubated at different rates. This illustrates for MFC technology to continue moving forward with greater energy generating capacity, environmental variables and soil types are key factors to take into consideration.

3.6 The Future of Manufacturing: Validating the use of a Digital Twin for a Drug Manufacturing Process, by Peter McSweeney (Cork Institute of Technology), Craig Murphy

Emulate3D is a virtual productive engineering tool that can be used for the purpose of design, layout, improvement and implementation of a drug manufacturing process through to packaging and storage before physical construction commences. The objective of this project is to demonstrate the benefits Emulate3D can have on making the validation process easier such as early detection of errors in the design phase, therefore reducing time and cost by carrying out corrective action early on in projects. The Pharmaceutical industry is making improved use of cyber-physical production systems with a specific focus on Digital Twins. Much research has been carried out on how they are capable of being adopted to carry out corrective actions, such as; to enhance the performance of in-progress processes, immensely minimise the quantity of material utilised in the design of a manufacturing process, reduce risk, improve quality and accelerate time to market. Figure 1 highlights the Digital Twin composition from the physical world to the digital world and back to the physical world, which constitutes the pathway to Industry 4.0 (fourth industrial revolution). Demo3D (Emulate3D software for developing and presenting initial solutions) can be used to aid a digital twin in the virtualisation of a physical manufacturing process. Sample manufacturing production lines were created to highlight the effectiveness of Emulate3D and how it can be used in the Pharmaceutical industry. Future prospects of Emulate3D are the potential to design and simulate a bioreactor process.

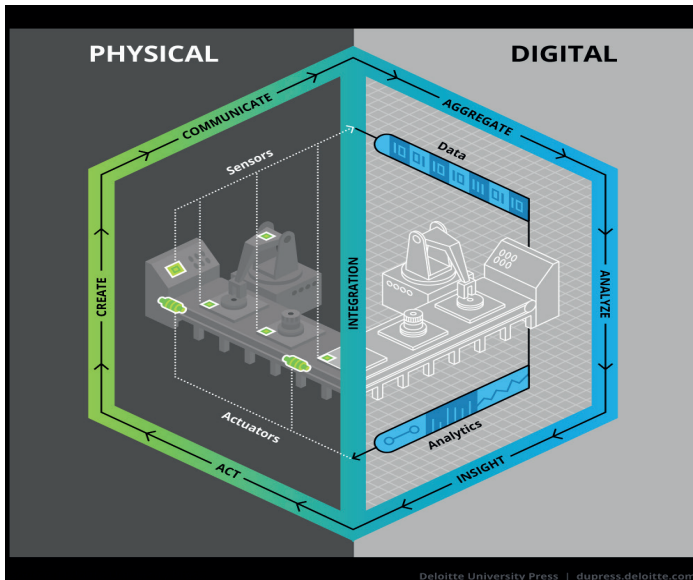


Figure 1 Image of a Manufacturing Process for a Digital Twin

3.7 Ecotoxicology studies on recycling derived fertilisers using nematodes as environmental indicators, by Andrew King (Institute of Technology, Carlow), Thomais Kakouli-Duarte, Anna Karpinska

An investigation on the ecological safety of recycled derived fertilisers (RDF) was carried out using entomopathogenic nematodes (EPN; *Steinernema feltiae*) as environmental indicators. Two sub-lethal nematode endpoints were monitored: their ability to kill an insect host (*Galleria mellonella*) in the presence of RDF, and the ability of the RDF exposed nematodes to subsequently reproduce. Five RDF were selected for analysis; ammonium sulphate, ammonium nitrate, pig urine, ammonia water and concentrate after evaporation (CaE). Three control treatments were employed for comparisons with the RDF treatments including: a conventional chemical fertiliser control (calcium ammonium nitrate [CAN]), a control containing no fertiliser (control 1) and a control containing no fertiliser and no nematodes (control 2) as a reference for insect mortality. Across a project duration of 10 weeks, preliminary preparatory project work was followed by five weekly time sampling points where results were obtained for *S. feltiae* infectivity and fecundity. A series of statistical analysis tests were then carried out on the average *S. feltiae* reproduction in each treatment and at each of the time sampling points. The null hypothesis, that the EPN reproduction was similar for all treatments being analysed, was thus accepted. This was part of a wider Interreg-NWE project called ReNu2Farm, aiming at increasing the recycling rates of soil plant nutrients in the primary food production chain in Northwest Europe (NWE). As part of that project deliverable, the outcome of this investigation was the desired result: that the RDF did not have a detrimental effect on these soil indicator organisms.

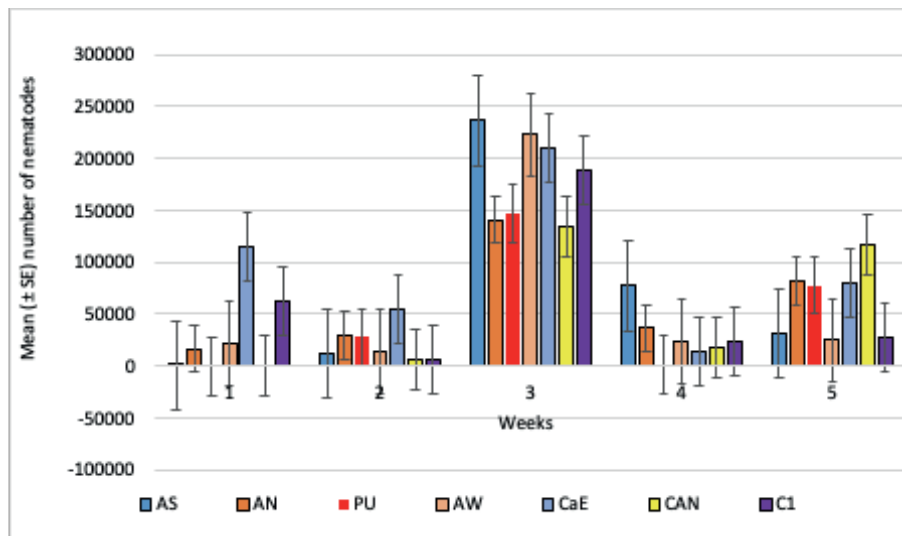


Figure 1. Comparison of average nematode reproduction for all treatments (except control 2) over the five-time sampling points. An increase in nematode populations in the third sampling point was likely due to the nematodes requiring more time to come out of the *G. mellonella* larvae.

3.8 Computational screening for potential inhibitors of SARS-COV-2 Main Protease, by Margaux Labrosse (Technological University Dublin), James Curtin, Gemma Kinsella, Ajay Pal, Julie Mondala

Severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) is the causative agent of the 2019-2020 coronavirus pandemic. No targeted therapeutic agents for the resultant COVID-19 condition have been discovered yet and effective alternatives are limited. The viruses' main protease (M^{pro}) plays a key role in inducing viral replication and transcription, making it an attractive target for therapies. The purpose of this study was to determine possible inhibitors of the SARS-Cov-2 M^{pro} through a computational study, by combining a bioinformatics approach to examine protein sequence similarities, molecular docking, pharmacophore modelling and virtual drug screening.

Given the high conservation of the coronaviruses binding pockets and catalytic site, inhibitors from other coronaviruses can be used as models for designing novel therapeutics for SARS-Cov-2. Through the docking of multiple compounds including drug candidates currently in clinical trials and the study of their interactions with the M^{pro} binding pocket some required functionality/interactions were highlighted. The more interesting compounds were used to generate a common feature pharmacophore for virtual screening of available ligand/natural product databases (>100,000 compounds) to identify novel inhibitors. The generated pharmacophore had 5 features, 4 hydrogen acceptor and 1 hydrophobic interaction. Through the tiered computational screen, Vumon, Ceftolozane, Doxorubicin and Asunaprevir were identified as potential inhibitors in the available and clinically approved compounds. Of these Vumon had the best interactions with the binding pocket (fig.1) while Asunaprevir was of interest as a known protease inhibitor for hepatitis C. Such computationally predicted inhibitors could impede protease function thereby inactivating the virus.

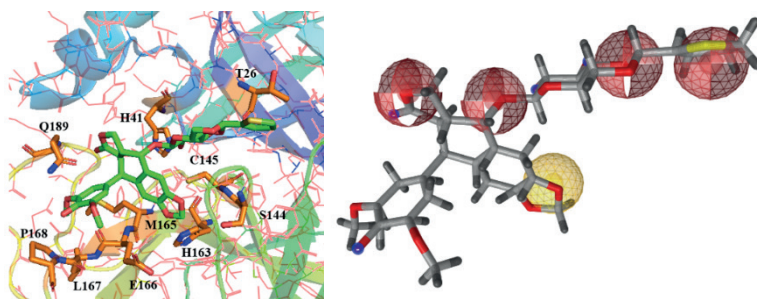


Figure 1: Vumon (left) docked in SARS-Cov 2 M^{pro} binding pocket (pyMOL) and (right) with the pharmacophore structure (red sphere: hydrogen acceptor, yellow: hydrophobic interaction) (LigandScout 4.3)

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