



**QUEEN'S
UNIVERSITY
BELFAST**

**POSTDOC
SOCIETY**

Postdoc Showcase 2024

“Helping to Shape a Better World”

**Postdoc
Showcase
2024**

HELPING TO SHAPE A BETTER WORLD

Monday 16th September
09.30-18.00
The Malone Hotel, Belfast



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**POSTDOC
SOCIETY**

Monday 16th September 2024

09:30 – 18:00

The Malone Hotel, 60 Eglantine Avenue, Malone Road, Belfast

go.qub.ac.uk/showcase24

[#LovePostdocs](#) [#NPAW2024](#)

Welcome to the Postdoc Showcase!

It is with great pleasure that we welcome you to the Queen's Postdoc Showcase which runs the week of National Postdoc Appreciation Week (NAPW) 2024.

This year we are delighted to have Professor Clements, Pro-Vice-Chancellor for Research and Enterprise to officially open the showcase, an update from the Postdoctoral Development Centre from Dr Alice Dubois, and 5-minute flash talks from across the three Faculties at Queen's. We are also excited to have our panel discussion relating to the theme of this year's showcase 'Life After Postdoc'.

The Postdoc Showcase is a celebration of the valuable contribution postdocs play in enhancing the University's research and reputation. As part of this, in an effort to raise the profile of postdocs and research staff across QUB, we will be showing researcher profiles across social media during NPAW and the week leading up to the Postdoc Showcase.

On behalf of this year's organising committee, we hope you enjoy the programme and thank you attending the Postdoc Showcase 2024!

2024 Showcase Organising Committee.

With support from Lisa Douglas, Erin Davidson and Alice Dubois from the Postdoctoral Development Centre.

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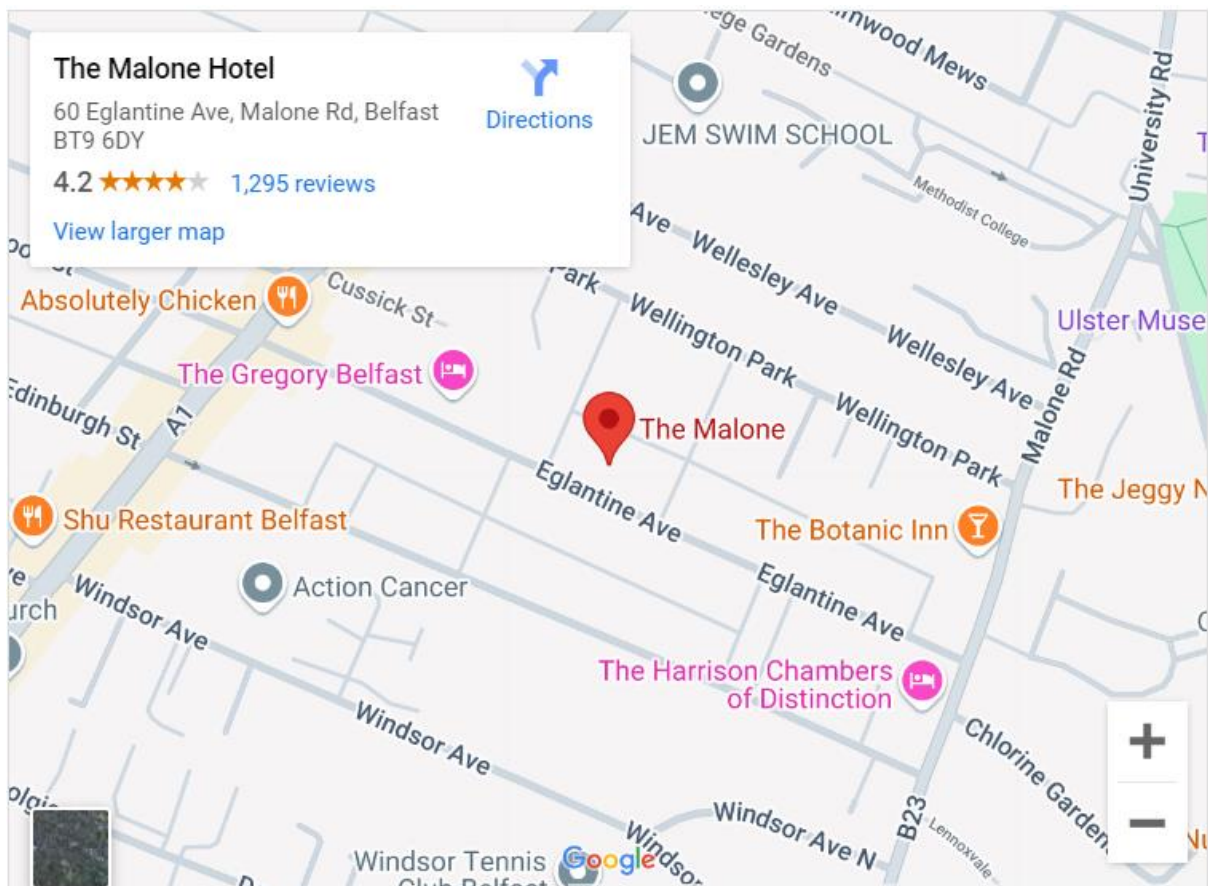
For sustainability reasons, please do not print this booklet or only print the pages you feel you need. The programme will be displayed at the venue, and QR codes to an electronic version of this booklet will also be available.

Practical information

Location

The Malone Hotel

60 Eglantine Avenue, Malone Road, Belfast, BT9 6DY



Food

Food has been ordered to include vegetarian and vegan options in order to offer options to as many guests as possible. When reported to us during online registration, other specific dietary options have been ordered to accommodate additional restrictions or allergies.

Programme

09:30 – 10:00	Registration With Tea, Coffee & Pastries
10:00 – 10:20	Welcome <ul style="list-style-type: none"> • Dr Danielle Logan Postdoc Society Chair • Dr Alex Lucas Postdoc Society Deputy Chair • Professor Archie Clements Pro-Vice-Chancellor for Research and Enterprise
10:20 – 10:30	Postdoctoral Development Centre Update Dr Alice Dubois
10:15 - 11:45	<p>“Life After Postdoc” Panel Discussion</p> <p>Short introductions by each panellist, followed by a moderated and open panel discussion</p> <ul style="list-style-type: none"> • Dr Darren Gray Almac Group • Dr Alice Dubois Postdoctoral Development Centre, QUB • Dr Sean Cullen Lecturer - Faculty of EPS, QUB • Dr Charles Vincent Reader - Faculty of AHSS, QUB • Professor Karen McCloskey Professor - Faculty of MHLS, QUB <p><i>Chairs: Alex Lucas and Omololu Fagunwa</i></p>
11:45 – 13:15	<p>Lunch and Poster Session</p> <p>Poster presenters to please be around their posters as follows:</p> <ul style="list-style-type: none"> • 12:10 to 12:40 for even poster numbers • 12:40 to 13:10 for odd poster numbers
13:15 – 14:30	<p>Session 1: Flash Talks</p> <p>Sustainable Cities and Communities and/or Innovation and Infrastructure SDGs:</p> <ol style="list-style-type: none"> 1. Mike Hardy: “Strength in Nano-Places: Iron Nanodome Biosensors for COVID19 Prevention” 2. Rebecca Jane McConnell: “The Future Blueprint: Design and the Super Wicked Provocation” 3. Henry Hui: “Deploying Security Systems amidst the AI boom” 4. Saima Ansari: “Synthesis and characterization of liquid crystalline mesophases” 5. Hannah McAleese: “Strategies for entanglement distribution in optical fibre networks”

	<p>6. Natasha Mohamad: “How Life Cycle Assessment (LCA) Help Understand Environmental Impact and Combats Greenwashing”</p> <p>7. Ying Zheng: “Visualising Island Storytelling: A language of Multifaceted Technology for Sustainable Future Planning and Landscape Design”</p> <p>Climate Action SDG:</p> <p>8. Marina Reyne: “Climate change and emergence of wildlife diseases in the Arctic”</p> <p>9. Heidy Dias: “Mapping biotopes to support conservation in deep-sea ecosystems: a case study of the Tropic seamount”</p> <p>10. Christina Kelly: “Irish Ports: navigating transformative change”</p> <p>11. Michael Bingham: “Tackling sustainability using solar driven 3D-printed reactors: Towards a synthetic machine”</p> <p>12. Sadish Oumabady: “Circular economy through carbon materials for a sustainable future”</p> <p>13. Eva Grew: “Poles Apart? Effects of Group Membership on the Consumption and Transmission of Polarized Information Among Youth in a Divided Society”</p> <p><i>Chair: Danielle Logan</i></p>
<p>14:30 – 15:00</p>	<p>Break (afternoon tea)</p>
<p>15:00 – 16:00</p>	<p>Session 2: Flash Talks</p> <p>Good Health and Wellbeing and/or Reduced Inequalities SDGs:</p> <p>1. Joe Livingstone: “Developing the Sus-Health index”</p> <p>2. Tony Benson: “What should a sustainable, locally sourced plant-based product look like? Findings from workshops with consumers”</p> <p>3. Katie Curran: “A Patient and Public Involvement and Engagement (PPIE) Investigation into Sleep and Vision Impairment”</p> <p>4. Duyen Nguyen: “New wine in old bottle: Understanding the age – period – cohort patterns in lifestyle behaviours in Northern Ireland from 1985-2015”</p> <p>5. Natalie Fisher: “The un-usual suspects; identifying novel biomarkers for future cancer risk in bowel screening”</p> <p>6. Rayhanual Islam: “Developing a novel controlled release implant to enhance the radiation sensitivity of localised prostate cancer”</p> <p>7. Clare Mills: “Novel diagnostics to rule out bacterial infection in infants with fever”</p> <p>8. Abraham Abraham: “SmartReservoirs: Let’s Make Smart Drug Carriers for Tomorrow”</p>

	<p>9. Gerard Walls: “Entresto as a novel radioprotectant in a partial heart irradiation model”</p> <p>10. Thomas Thompson: “Enhancing Water Sanitation and Combating Antimicrobial Resistance”</p> <p><i>Chair: Sarah Baxter</i></p>
16:00 – 16:20	<p>PDC Postdoc Awards</p> <p><i>Chair: Lisa Douglas</i></p>
16:20 – 16:40	<p>Showcase Prize-giving and Closing Remarks</p> <p><i>Chair: Postdoc Society</i></p>
16:40 – 18:00	<p>Drinks Reception</p>

Invited Guests & Speakers

Professor Archie Clements, Pro-Vice-Chancellor Research & Enterprise



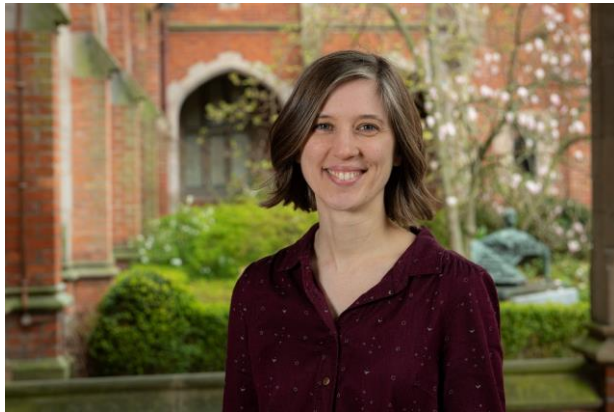
Prof Clements joined Queen's University Belfast in December 2023 as Pro-Vice-Chancellor (PVC) Research and Enterprise. As PVC, he is a member of the University Management Board, and is responsible for leading the development and implementation of the University's research strategy. He chairs the University Research and Innovation Committee and other decision-making bodies involved in research and enterprise. He is also the academic lead for implementation of the Belfast Region City Deal. Prior to joining Queen's University Belfast, Prof Clements held leadership roles at University of Plymouth, Curtin University in Western Australia and the Australian National University. He is an infectious disease epidemiologist and has studied the spatial epidemiology of parasitic, bacterial and viral diseases, predominantly in tropical regions of the world. Prof Clements has also worked on community-based intervention studies exploring the role of multi-component, integrated strategies for sustainable infectious disease control. As of December 2023, he co-authored over 300 peer-reviewed publications and been a chief investigator on competitively awarded research grants valued at over £18M.

Dr Darren Gray, Almac Group



Dr Darren Gray is a Technical Leader within Almac's Biocatalysis group. After obtaining a degree in Biological Sciences and Masters in Biomolecular Structure and Function, Darren obtained a PhD in 2014 from Queen's University Belfast. He worked for a further five years as a postdoc in the Institute for Global Food Security, during which he was co-chair of the MHLS postdoc society and school representative for the QUB Postdoctoral Forum. Darren's career has focussed on the expression and application of recombinant enzymes for vaccine and diagnostic applications, with further expertise in the use of omic technologies for Biomarker discovery. He joined Almac in 2018 as a molecular biologist where he has been heavily involved in the development and commercialisation of Almac's Biocatalytic Oligonucleotide Synthesis Technology (BOOST).

Dr Alice Dubois, Postdoctoral Development Centre QUB



Alice holds a PhD on innate immune mechanisms and proteolysis from the University of Tours in France, and moved to Queen's University Belfast as a lung immunity postdoc in the Wellcome-Wolfson Institute for Experimental Medicine in 2014. After four years as a postdoc, she moved to an exciting administrative position, establishing a brand-new hub to support postdocs and their career development: the Postdoctoral Development Centre. Initially based in the Faculty of Medicine, Health and Life Sciences, Alice piloted some structures and policies for postdocs at Faculty level, and worked with colleagues across the University to widen the PDC to support all university postdocs, which was achieved in 2021.

As PDC Manager, Alice oversaw the general strategy of the PDC, its programme of activities (workshops, events, postdoc awards), delivered inductions, one-to-one career support, worked with postdocs and academic representatives from Schools, Centres and Societies, as well as with a range of collaborators in the university and beyond to improve our policies and environment for postdocs. She was notably involved in introducing the allocation of 10 career development days per year for postdocs, creating the PDC Postdoc Awards, the PDC website, the Postdoctoral Leadership Programme, the PDC Representatives' Network, the Assistant Supervisor role and supporting the creation of the central Postdoc Society.

Since April 2024, Alice took on the new role of Research Culture Manager, which involves managing the Research Culture sub-team, including the PDC Officer and Research Careers and Employability Officer from the PDC. While she is still responsible for Queen's implementation of the Researcher Development Concordat, PDC strategy and work on policy applying to postdocs, her other former responsibilities are now held by other PDC team members, and she instead focuses on broader aspects of Research Culture. This includes the design and implementation of the university's Research Culture Action Plan, contributing to delivering the Northern Ireland Research Culture project (funded by Wellcome), and supporting institutional planning and submission to the 'People, Culture and Environment' section of REF 2029

Dr Seán Cullen, Lecturer – Faculty of EPS, QUB



Seán is a Lecturer in Architecture in the School of Natural and Built Environment, QUB. From 2019-2021, he worked as a post-doctoral research assistant on *Moveable-Nexus*, a design-led research project which integrated urban agriculture in neighbourhoods to reimagine the food-water-energy nexus. Since his post-doc, Seán's research has included: *Ideal Home*, funded by Innovate UK, which proposed three radical poultry houses of the future to meet net-zero ambitions while improving animal welfare, embedding circularity in the construction and resource management of the house; and, *Future Island-Island*, funded by AHRC, which will accelerate design ecosystems for the green transition in Northern Ireland.

Dr Charles Vincent, Reader – Faculty of AHSS, QUB



Charles V. is a Reader in AI for Business and Management Science at QBS, Queen's University Belfast. He also holds multiple honorary visiting professorships globally. His expertise lies at the intersection of AI and Management Science, focusing on enhancing business productivity, regional competitiveness, and societal welfare, and a well-rounded commitment to driving positive multi-dimensional impact. With over 25 years of experience in teaching, research, and consultancy, Charles has served as a full professor and director of research for over a decade in triple-crown accredited business schools. He is a former Elected Member of the Senate at the UoB and a postdoctoral research fellow from the National University of Singapore.

Charles earned Executive Certificates from MIT Sloan School of Management, Harvard Business School, and IE Business School, and is also a certified Six Sigma Black Belt. His professional affiliations include being a Fellow of the Royal Statistical Society, a Fellow of the British Computer Society, a Senior Fellow of Advance HE, a Senior Member of INFORMS (USA), and a Senior Member of The Society for the Study of Artificial Intelligence and Simulation of Behaviour, among others. He is also a member of the ESRC Peer Review College.

He has published extensively and is a recipient of numerous academic honours and awards. These include Distinguished Research Professor awards, Intellectual Contribution awards, Best Paper awards, and the 2013 Award in the category of The Most Innovative Study from the Premio PODER to Peru's Think Tank of the Year. He is an AWS Accredited Educator and Certified Cloud Practitioner, and an Advance HE Certified External Examiner. He serves as an Associate Editor and special issue editor for many prestigious journals. He also has industry experience as a Chief Analytics Officer and has worked on projects in the telecommunications and retail industries

Professor Karen McCloskey, Professor – Faculty of MHLS, QUB



Karen McCloskey is Professor of Physiology in the School of Medicine, Dentistry and Biomedical Sciences at Queen's University Belfast. She has served as Deputy Director of the Patrick G. Johnston Centre for Cancer Research. She teaches across undergraduate and postgraduate programmes and supervises PhD students and research fellows. Professor McCloskey's research interests include urological cancers and bladder dysfunction with the aim of combatting cancer while minimizing treatment side-effects on the bladder. Her group harnesses methodologies across physiology, molecular biology, advanced imaging and cell/tissue/organ/organism approaches.

Professor McCloskey is Director of the Queen's Gender Initiative and led the recent Institutional Athena Swan Gold Award (Advance HE Charter for Gender Equality in Academia). She is an advocate for equality, diversity and inclusion in academia and established the Racial Equity Programme at Queen's. Having witnessed the positive impacts of mentoring, she serves as a Mentor for school pupils, students, postdocs and academics, and has established new Mentoring programmes in Queen's. Professor McCloskey is passionate about engendering an inclusive culture where everyone has a sense of belonging with individual and collective contributions valued.

Session 1: Flash Talk Abstracts

1. Mike Hardy: “Strength in Nano-Places: Iron Nanodome Biosensors for COVID19 Prevention”

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Sustainable Development Goals:



Nanoimprint Lithography (NIL) is a promising tool in biosensor fabrication, which can lower the cost per measurement, by using a scalable stamping process [1]. However, NIL often lacks fidelity between the template and the final structure, which is a hindrance towards use in quantification in analytical studies. Here, we look at how flat the sensing surface is via white light spectroscopy in a transmission set-up. Principal component analysis, which is an unsupervised machine learning technique that can find small differences in many variable datasets, was performed over a range of 0-1°. Confidence ellipses overlapped signifying (at $p=0.05$) that the performance of the sensor is insensitive to small imperfections in flatness profile up to 1° in planar angle misalignment. However, plane angle mismatch of up to 10° was also investigated showing clear differences. Thus, for optimal sensitivity incident light should interact with the substrate plane $<4^\circ$. Raman spectroscopy is an analytical technique that provides a ‘molecular fingerprint’ of a target molecule, and whose signal can be boosted when the molecules are close to metal-coated nanostructures. Here, the sensor signal uniformity was evaluated at a relative standard deviation of 13% via Raman spectroscopy mapping of gelatine (a mucal lining approximation) and gellan fluid ($n=10$), which has promise as a nasal spray constituent to combat SARS-CoV2 infection. The substrate is iron-metallised for prospective application in the emerging area of bio-magneto-plasmonics. While the current study looks at periodic nanostructure arrays it is potentially generally applicable to nanostructure platforms with different kinds of imperfections. This work lays the foundation for the development of more reliable biosensors for quantitative study.

[1] Stokes K, Clarke K, Odetade D, Hardy M & Goldberg Oppenheimer P. Advances in lithographic techniques for precision nanostructure fabrication in biomedical applications Discover Nano (2023) 18 1

2. Rebecca Jane McConnell: “The Future Blueprint: Design and the Super Wicked Provocation”

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Sustainable Development Goals



This research explores the role of design in addressing the multifaceted challenge of climate change, conceptualised as a Super Wicked Problem due to its complexity, interconnectedness, and resistance to simple solutions. Designers are uniquely positioned to confront this issue, leveraging their capacity to envision possibilities, integrate diverse elements, and craft solutions that are both functional and inspiring. The potential of design in climate adaptation is illustrated through a series of drawings, termed ‘Provocations’. The first provocation reimagines Dublin, a city at risk from rising sea levels, by decanting its buildings to higher ground. This provocation redefines the city’s relationship with water, fostering an urban renaissance. The second provocation addresses the challenge of excess rainfall in Derry, proposing an urban landscape enriched with green rooftops and vertical gardens named Sponge City. These interventions absorb rainfall, reduce flooding, and create verdant, breathable spaces, enhancing urban sustainability and resilience. The third provocation focuses on Cork, which faces increasing vulnerability to flooding. Here, the design features elevated walkways and floating neighbourhoods, ensuring safety and continuity while introducing floating gardens and communal spaces that enhance resilience and aesthetic value. These provocations extend beyond mere visual representations; they are bold statements that challenge conventional thinking about urban environments and climate adaptation. They aim to provoke thought and inspire action. Each drawing encapsulates the essence of futures transformation, guiding readers through conceptual explorations of spatial understanding. The provocations ultimately rouse a response as they guide us through potential future scenarios of urban resilience. Designers possess a unique ability to navigate the complexities of climate adaptation by offering clear and imaginative solutions. Creativity, vision, and a willingness to reimagine our world are essential tools in addressing climate challenges. This presentation underscores the imperative to harness the power of design in shaping a resilient and sustainable future.

3. Henry Hui: “Deploying Security Systems amidst the AI boom”

Email: h.hui@qub.ac.uk

Sustainable Development Goals:



Cyber security has been one of the biggest challenges for data centres across the globe. The recent boom in Machine Learning (ML) and Artificial Intelligence (AI) have accelerated the adaptation of various forms of machine-driven security solutions, e.g. ML-assisted security alerts and Network-based Intrusion Detection Systems (NIDS). However, most of the rapid adaptations are not necessarily caused by the maturity of the technologies but instead by their popularity. Inefficiency hence became a significant issue in data centres. Extra computation (and hence electric) power is consumed by AI deployment on security systems while producing significant false/miss alerts. Meanwhile, data centres are combating attacks that are increasing automated using the very same technologies. Therefore, with the aid of cutting edge Nvidia technologies like Graphics Processing Units (GPU) and Data Processing Units (DPU), this project aims to provide a systematic approach that can efficiently deploy AI/ML for attacks detection without the huge power and computational cost while achieving high detection accuracy to protect data centres, and eventually, the end users.

4. Saima Ansari: “Synthesis and characterization of liquid crystalline mesophases”

Email: s.ansari@qub.ac.uk

Sustainable Development Goal



Liquid crystal molecules are transitional states between liquid and crystalline forms at certain temperatures. They are utilized in displays in telecommunication and computing devices. The main objective of the synthetic endeavor is to create polar liquid crystalline phases with a wider temperature range by varying the molecular dipole moment and its angle. Ferroelectric nematic liquid crystals are gaining wider applications as they have both orientational and translational order. An unprecedented molecular topology in liquid crystal chemistry can be investigated with the twisted bent bimesogens having an apex biaryl linkage (transient chiral axis), hence, restricted bond-rotation. Positive and negative anisotropy can be explored by variation in the sulfur-based bimesogen containing a flexible aliphatic central linker.

5. Hannah McAleese: “Strategies for entanglement distribution in optical fibre networks”

Email: h.mcaleese@qub.ac.uk

Sustainability Development Goal:



Communication technology is undergoing a quantum revolution and the physical property underlying this is quantum entanglement. If two particles are entangled and we measure one, the other will instantly be affected - no matter how far apart they are. From this, new inherently secure communication protocols have been developed as anyone tampering with the sent information can be detected. One large focus of current quantum communication research is how to send entangled light particles over optical fibres. The vital role of fibre-optics in telecommunications is reflected in the vast networks already in place. It has been shown that entangled particles can be produced, sent through these existing networks and successfully used to create secret keys for secure communication. The problem is that entanglement is sensitive to noise and environmental effects. Sending entangled particles over long distances causes the entanglement to degrade. However, it is possible to entangle particles situated at distant locations by sending another particle which is surprisingly not entangled with any of the others. This counter-intuitive result has been subject to rigorous study. However, aside from proof-of-principle experiments, this work has largely remained theoretical and abstract. In our work, we ask: is this alternative protocol actually useful in a real-world setting? Collaborating with networking engineers in Trinity College Dublin, we model an optical fibre network and compare the performance of "direct" and "alternative" protocols. We take several aspects of the physical network into account such as the equipment needed, the probability of losing a light particle and the sensitivity to noise in the fibre in each case. We find that there is no clear winner, but instead present the network conditions where the "direct" method is best and where the "alternative" method has the edge.

6. Natasha Mohamad: “How Life Cycle Assessment (LCA) Help Understand Environmental Impact and Combats Greenwashing”

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Sustainability Development Goals:



Life Cycle Assessment (LCA) tool is gaining traction in the past years. LCA is essential for evaluating the sustainability of products by systematically analysing their environmental impacts across their entire life cycles study highlights the significance and real-world relevance of LCA in promoting sustainable practices and combating greenwashing. By providing a comprehensive methodology, LCA assesses environmental performance from raw material extraction, production, and use to end-of-life disposal or recycling. Various impact categories such as global warming potential, resource depletion, and ecological toxicity are incorporated to offer detailed insights into the environmental burdens associated with each stage of a product’s life. This holistic approach allows researchers, manufacturers, and policymakers to identify environmental hotspots and confidently communicate the impact of their products. The methodology involves collecting and analysing data on material and energy inputs and outputs at each life cycle stage. Standardised metrics and international guidelines, such as ISO 14040 and ISO 14044, ensure the objectivity and reliability of the results. The rigorous and transparent framework provided by LCA effectively reduces the risk of greenwashing, enabling substantiated sustainability claims and informed consumer decisions by ensuring a balanced assessment through covering multiple environmental impact categories and adhering to stringent documentation and transparency standards. The impact of this work is significant as it fosters genuine sustainability efforts, enhances regulatory compliance, and meets growing consumer demand for environmentally responsible products. By mitigating the risk of greenwashing, LCA tools support more sustainable product development and innovation, ultimately contributing to global environmental conservation efforts.

7. Ying Zheng: “Visualising Island Storytelling: A language of Multifaceted Technology for Sustainable Future Planning and Landscape Design”

Email: y.zheng@qub.ac.uk

Sustainability Development Goals:



Islands have long been repositories of diverse cultures, histories, landscapes, ecosystems, biodiversity and narratives, offering unique insights into the human experience. This paper aims to produce a visually engaging compilation of narratives from diverse perspectives, providing a comprehensive understanding of islands for urban planners, designers, environmental advocates, authorities, and other stakeholders. It explores various visual mapping languages used in island storytelling, delving into the multifaceted perspectives that shape these narratives. A language of multifaceted technology employed includes ArcGIS Field Maps, Historical Environment Map Viewer, Google Street View and Biological surveys. Through these methods were chosen to provide a comprehensive understanding of the islands' cultural and ecological landscapes, integrating various sources of information into a coherent and accessible format. Visual mapping languages of island storytelling is based on Rathlin Island, UK, within Northern Ireland's northernmost point. Based on those methods, it is possible to shift the public towards a more sustainable way of thinking and at the same time provide them with high-quality, easy-to-understand information on the island. The findings of this study demonstrate that island storytelling, based on holistic landscape character analysis approaches, which emphasize visual perception, cultural, and ecosystem aspects of the island landscape, is essential for understanding the complexities of island environments. By integrating multiple perspectives and considering the socio-cultural and ecological context, such approaches offer a nuanced understanding of island landscapes that can inform more sustainable and resilient planning and management strategies.

8. Marina Reyne: “Climate change and emergence of wildlife diseases in the Arctic”

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Sustainable Development Goals:



Environmental shifts linked to climate change are increasingly associated with emerging of infectious diseases, posing potential threats to both wildlife and human health. Over the past century, the Arctic has experienced temperature rises at a rate double the global average, with projections indicating an acceleration of this warming trend. Given the rapid change of these environmental shifts in the Arctic, the introduction and spread of new pathogens could have major impact on previously unexposed wildlife hosts and promote opportunities for pathogen spillover. Indeed, evidence suggests that changes in pathogen communities are already underway. Notably, two pathogens - *Erysipelothrix rhusiopathiae* and *Brucella suis* biovar 4 - have emerged in the Canadian Arctic posing serious risk to the survival of key species like muskox and caribou, which are vital to local communities, and present a public health risk for those handling or consuming country foods. This study aims to understand how environmental parameters contribute to the emergence and spread of the two bacterial pathogens across the Arctic landscape and identify major factors that drive pathogen transmission in ungulates. We investigated the potential application of landscape genomics to better understand wildlife disease dynamics through combining remote sensing and next generation sequencing data. Spatial genetic structure was determined using both Bayesian and non-Bayesian clustering analysis while the influence of environmental factors on pairwise genetic distances between muskoxen carcass sites was tested using Isolation-by-distance and Isolation-by-resistance based on least-cost path and circuit theory models of functional connectivity. We aim to show how implementation of landscape analysis, molecular epidemiology and disease ecology can drive important cross-disciplinary progress.

9. Heidy Dias: “Mapping biotopes to support conservation in deep-sea ecosystems: a case study of the Tropic seamount”

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Sustainability Development Goals:



Effective conservation of deep-sea ecosystems requires detailed knowledge of the species spatial distribution and ecological characteristics. However, despite advanced technologies, the deep-sea ecosystems remain poorly characterised. Biotope derivation is a crucial tool in marine conservation, offering a simplified yet effective approach to identify and quantify ecological changes. Here, we present a biotope map for the Tropic Seamount; a flat-topped underwater mountain located in the Northeast Atlantic Ocean off the coast of Northwest Africa. In this study, we emphasise the efficiency of biotope classification by employing a hybrid approach that merges relatively acoustic data with video data. This information will support in environmental impact assessments, particularly in the context of fishing impacts and potential deep-sea mining activities. Mapping the biotopes at the seamount revealed the presence of biotopes of high conservation value, with some being classified as Vulnerable Marine Ecosystems (VMEs). This study serves as a baseline for future standardised assessments. Through the development of robust models for future studies, biotope derivation aids in designating high priority areas for conservation. By facilitating a better understanding of baseline conditions and the impacts, biotope characterisation proves to be an invaluable tool in marine conservation efforts, ensuring the protection of vulnerable deep-sea environment

10. Christina Kelly: “Irish Ports: navigating transformative change”

Email: Christina.Kelly@qub.ac.uk

Sustainable Development Goals:



Ports are complex systems with varying operations, functions, assets and management mechanisms that are affected by the economy, culture, policies, local communities, geographical locations and wider governance considerations. This makes it difficult to manage and govern ports in an integrated manner. Sustainable and Holistic management of Irish Ports (SHIP) was a 3-year project funded under the EPA Research Programme 2014–2020 that investigated how these issues may be overcome through active research engaging with a wide range of maritime stakeholders and will contribute to national efforts to transition towards sustainability within these sectors. SHIP developed a framework to help minimise and prevent potential environmental damage caused by unsustainable port operation practices over the short, medium and long terms. The framework encompasses a suite of recommendations and enabling conditions under the themes of governance, innovation, decarbonisation, linkages, and efficiency and investment. This framework is based on the findings of a literature review, desktop study of international port practices and active research involving port stakeholders. The research also found that the role of particular port stakeholders in developing future sustainability actions and planning for the long term in Irish ports is unclear. It is recommended that ports, in collaboration with a diverse range of port stakeholders, identify key actors from the public, private and civil sectors to help them create a vision and implementation plan for their long-term future.

11. Michael Bingham: “Tackling sustainability using solar driven 3D-printed reactors: Towards a synthetic machine.”

Email: michael.bingham@qub.ac.uk

Sustainability Development Goals:



Synthetic chemistry processes have inherent inefficiencies including reagent excess and excessive quantities of organic solvents. With global concerns around sustainability, this project plans to address this challenge by developing novel 3D-printed photoreactors utilising flow chemistry and solar energy; these would (i) minimise solvent use and waste, only using minimum volumes of solvent in flow (ii) limit the use of expensive platinum group metals by utilising low loadings or availing of alternative metals e.g. nickel and copper. The flow reactor format would negate any potential drop in efficiency, while photocatalysts, shown to be effective under solar energy conditions, are also employed. Upon the successful design of the photoreactor and extensive testing on carbon-carbon coupling reactions, artificial intelligence and machine learning algorithms will identify potential synthetic routes for total/partial syntheses in flow. Implementation of this would allow for the assembly of a “synthetic machine” using modular and bespoke reactors with the potential for commercialisation. This synthetic machine would allow for high throughput prototyping that would transform the discovery and manufacturing of pharmaceuticals and natural products.

12. Sadish Oumabady: “Circular economy through carbon materials for a sustainable future”

Email: s.oumabady@qub.ac.uk

Sustainable Development Goals



Circular approaches to revalorise waste biomass from agriculture and food production sectors hold significant promise in multidisciplinary environmental applications. Carbon-rich materials derived from biomass through thermochemical biomass conversion technologies like pyrolysis and hydrothermal carbonisation deliver a cascading impact to the environment. Their utilization spans across waste management, water purification, and energy production, embodying a sustainable approach to resource management. Moreover, it also acts as a carbon sink, sequestering carbon dioxide from the atmosphere and curbing methane emissions, thus mitigating climate change. With its higher surface area and porosity, these carbon materials have proven effective in adsorbing pollutants and recovering nutrients, making them an excellent material for water purification and soil remediation. It can help to immobilize organic contaminants, protecting ecosystems and human health. In the energy sector, the char serves as a renewable energy source, whose combustion produces heat and bio-oil, which can be further processed into biofuels. This not only provides a sustainable energy alternative but also helps in managing organic waste. The integration of waste valorisation into industrial processes exemplifies the principles of a circular economy, where waste is transformed into valuable products, closing the loop of material flows. Additionally, their application in construction materials, such as concrete and bricks, enhances the durability and thermal properties of buildings, contributing to energy efficiency and reducing the environmental footprint. Overall, the multifaceted applications of waste-derived carbon materials in a circular economy highlight their potential to drive sustainability across various sectors. By leveraging these materials, societies can achieve greater environmental resilience, resource efficiency, and economic viability, paving the way for a more sustainable future. My research expertise for the past 7 years in the environmental applications of these carbon materials would help to showcase a circular economic waste management strategy for a sustainable future.

13. Eva Grew: “Poles Apart? Effects of Group Membership on the Consumption and Transmission of Polarized Information Among Youth in a Divided Society”

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Sustainable Development Goals:



In divided societies, adolescents from historically opposing groups are exposed to divergent political and historical narratives. Exposure to such divergent ‘truths’ may perpetuate intergroup conflict. We examined consumption and transmission of polarized information through relational chains among adolescents in Northern Ireland [NI]. 396 adolescents (age 12-18 years; 41.9 % Protestant, 58.1 % Catholic) read three narratives about polarized topics and were subsequently asked to write down their recollection of this narrative for the next participant, a procedure called the “diffusion chain”. Two of the narratives presented polarized information relevant to conflict-related group identities (the partition of Ireland and Irish Language Act) and the other narrative was polarized, but neutral to group identity (social media). Of interest was the fidelity of the original information across the chains. We investigated if the type of chain, either homogeneous (four adolescents from the same ethno-religious background) or mixed (alternating Catholic and Protestant backgrounds), would be linked with fidelity. Adolescents also reported the strength of their religious identities and cross-group friendship. We found that fidelity was significantly lower in the conflict narratives compared to the non-conflict polarized narrative, and in mixed (vs. homogeneous) chains. Nevertheless, this might be moderated by adolescent religious-ethnic background. We found no evidence for group-congruence bias in fidelity. Furthermore, we found that those with stronger religious identities had less cross-group friendship. We will further discuss the social factors which may be used to investigate conditions under which polarized information may be exacerbated or ameliorated amongst adolescents.

Session 2: Flash Talk Abstracts

1. Joe Livingstone: “Developing the Sus-Health index”

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Sustainability Development Goals:



The aim of this work is to produce a novel single index (the Sus-Health index) that describes both the nutritive value and environmental impact of meals to encourage consumers to make improved food choices regarding human and planetary health. The Sus-Health index was co-developed over an 18-month period with the synergy of different parts of the UK food supply chain (e.g., restaurants, governmental and local authorities, wholesalers). Designed specifically to assess meals, but applicable to individual foods and ingredients, the Sus-Health index is a product of existing Enviroscore and Nutrient Profiling Model (NPM) indices. Enviroscore was calculated using SimaPro 9 software and its databases. NPM was calculated using the Nutritics data base. The two separate indices were combined using the composite indicator methodology and weighting of 1:1. Results can be presented quantitatively or qualitatively on a scale of A (best score)-E (worst score). Presentation of the index was assessed using consumer studies. The index was applied to 8 meals from a local restaurant using their recipe and supply chain information. The meals included vegan, meat and seafood options.

Consumer studies indicated that presentation on menus as a “doughnut” was favoured with the overall score colour coded in the “core” together the two individual components in a colour coded surround. A range of A-D scores were found for the 8 meals assessed. Although the index was co-created with relevant stakeholders it was acknowledged that it is dependent on the limitations of the component parts: 1) NPM is restricted to a specific range of nutrients (e.g. does not consider specific micronutrients); 2) Calculations for assessing the Environmental Impact component invariably use highly aggregated data.

2. Tony Benson: “What should a sustainable, locally sourced plant-based product look like? Findings from workshops with consumers”

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Sustainability Development Goals:



The production and consumption of food significantly impacts our environment, responsible for 20-30% of consumption impact on the environment (1–3). Reflecting this, the UN has called for responsible consumption and production (SDG 12). However, food can also contribute to good health and well-being (SDG 3) (4). One way of achieving these goals is to diversify protein intake e.g. reducing meat consumption and increasing consumption of plant-based products. This study aimed to understand what consumers want as sustainable and local plant-based products. Specifically, the study focused on oat, wheat, barley, rye, and pea. Four workshops plus a follow-up workshop (n = 38, age range 22-80 years old) were held across Belfast and Dublin to understand consumers’ wants. Workshops discussed food purchasing, sustainability issues, and strategies to shift to a sustainable diet. Key tasks included drawing a local and sustainable product based on any of the 5 specified ingredients. Discussions were transcribed and initial findings using content analysis will be presented. Pea was a popular ingredient in participants’ product ideas. Products containing oats and wheat were also popular. Product types varied and included main meals, snacks, and drinks. While popular in the main workshops, consumers in the follow-up workshop (who evaluated products created in the main workshops) rejected pea-based products due to its taste. The final highest rated products were a bolognese product made with pea and barley, porridge oats, and wheat and barley pasta. These results reflect wider findings that taste is vital in new product development. Products similar to those already on the market ranked highly, in line with findings that familiarity is a key driver of acceptance of alternative proteins.

Working alongside consumers means these findings have great potential to inform the development of plant-based products that will be successful, ultimately helping to reach SDGs 3 & 12. This work was done as part of the Protein-i project that is kindly supported by the Department of Agriculture, Food and the Marine (DAFM) and The Department of Agriculture, Environment and Rural Affairs (DAERA), grant number 2021R546.

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3. Katie Curran: “A Patient and Public Involvement and Engagement (PPIE) Investigation into Sleep and Vision Impairment”

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Sustainable Development Goals:



Patient and Public Involvement and Engagement (PPIE) significantly enhances the impact and relevance of health research. Our multidisciplinary initiative aimed to integrate PPIE in exploring sleep disorders among individuals with vision impairment (VI). People with no light perception (NLP) often experience poor sleep due to disrupted circadian rhythms and irregular melatonin production, as they lack the natural light cues that synchronise their sleep-wake cycle. However, the prevalence and impact of sleep issues among those with milder VI are not well understood. This PPIE initiative involved collaborations with stakeholders, including individuals with VI, their carers, healthcare professionals, academics, and charities. Initial engagements included discussions with an individual with NLP, followed by focus groups with VI support groups and charities. A validated Insomnia Severity Index (ISI) survey was administered to assess sleep quality among people with VI. Survey data from 27 participants was collected between 19/04/2024 and 07/05/2024. Based on the ISI scores, 11 (40.7%) participants reported severe interference with daily functioning due to sleep problems, and 10 (37.0%) participants were very worried about their sleep issues. Focus group discussions revealed the significant impact of sleep difficulties on daily life, with one participant noting that "lack of sleep is more distressing than sight loss," and another reporting only two hours of sleep per night, resulting in persistent fatigue. This PPIE work highlights the importance of continued community engagement and stakeholder involvement to develop effective, accessible sleep strategies for people with VI. Collaborations with stakeholders, including Neurovalens, to test their Modius Sleep device in a pilot trial represent a promising step towards innovative, non-invasive sleep interventions. Further research is essential to explore the impact of VI on sleep and to develop tailored interventions that improve the quality of life for people with VI and their carers.

4. Duyen Nguyen: “New wine in old bottle: Understanding the age – period – cohort patterns in lifestyle behaviours in Northern Ireland from 1985-2015”

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Sustainable Development Goals:



Smoking declined substantially in UK over time but drinking remain problematic. Understanding how age, time-period or birth cohorts influenced these behaviours help to strengthen public measures in such area, but also highlight the potential of using age-period-cohort approach in epidemiology and social sciences. Data from the Continuous Household Survey in Northern Ireland was used focusing on current smoking and non-abstainer from 1985-2015. The behaviour patterns by age, calendar time (period) and birth cohorts were investigated through a descriptive analysis (supplemented by a joinpoint regression), then calculated by Intrinsic Estimator model. The analysis was performed using six 10-year age groups and nine birth cohorts (spanning those born before 1920 to generation of 1990-2000). Both smoking and drinking had a reverse V-shape in the age pattern indicating that these behaviours accelerated quickly during adolescence and young adulthood and then declined progressively with age (age 25-34 vs. all age groups: RR smoking =1.59, RR drinking=1.61, $p < 0.001$). Period effects confirmed the contrasting secular trends as smoking decreased and drinking increased substantially from 1985-2015. Cohort effects suggested that generation X (born between 1961-1980) might have a slightly higher likelihood of smoking and drinking. The age pattern highlighted that targeting efforts towards adolescents and young adults may offer the best chance of kerbing the establishment of smoking and drinking. The period patterns neatly reflected the difference between the historical timeline of smoking policy versus drinking where the absence of similar policy efforts may help explain the increasing prevalence of drinking over time. Lastly, although cohort effects in lifestyle behaviour were not as prominent as age and period effects, this study showcased the potential of this approach in examine other health outcomes where generational difference is of higher importance such as mental health or COVID-19 impact.

5. Natalie Fisher: “The un-usual suspects; identifying novel biomarkers for future cancer risk in bowel screening”

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Sustainable Development Goal:



Bowel cancer screening has increased the detection of early cancers/polyps, which can be removed locally, however >40% of people develop a future lesion. Unfortunately existing predictors of future polyp risk suffer from poor predictive value, adding increasing pressure on healthcare services and perpetuating patient anxiety of lesion recurrence. This project aims to deliver a series of unsupervised molecular subtypes of colorectal polyps, to enable biologically-guided refinement of the predictors of future polyp risk. Using transcriptional data from the INtegrated TeChnologies for Improved Polyp SurveillencE (INCISE) project (n=2642) a series of biological characterisation approaches, were applied to a training cohort from this study (n=1737). A large proportion of samples were classified as mixed/unknown when applying existing established colorectal cancer (CRC) subtypes (CMS:1488/1757; PDS:539/1757; CRIS:235/1757; iCMS:663/1757). These findings are potentially explained in that polyps do not have an established tumour microenvironment, which forms the basis of CRC molecular subtypes. Four polyp-specific subtypes (k1:500; k2:507; k3:306; k4:444) were developed using K means clustering of a biological-pathway dimensionality reduced matrix. Novel biomarkers of future polyp risk can now be interrogation within each polyp subtype without the confounding influence of differing biology. The added value of molecular biomarkers discovered in this study, integrated alongside the current clinical predictors, should be validated in the test dataset (n=757). In addition, the characterisation of polyp subtypes will enable improved preclinical model selection.

6. Rayhanual Islam: “Developing a novel controlled release implant to enhance the radiation sensitivity of localised prostate cancer”

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Sustainable Development Goals



Introduction: Previously, our group developed a gold nanoparticle (AuNP) formulation utilising a cell penetrating peptide, RALA; (RALA-AuNP)¹ which showed efficient intracellular delivery, and consequent radiosensitisation at an ultra-low AuNP microgram concentration. However, establishing a controlled delivery system for this formulation was challenging due to limited colloidal stability and issues relating hyper-concentration requirements necessary for developing a sustained release implant. Results: An optimised RALA:PEG-AuNP formulation was developed and successfully lyophilised. Upon reconstitution the nanoparticle retained colloidal stability under physiologically relevant ionic stress. RALA:PEG-AuNP was efficiently internalised across several prostate cancer cell models as revealed by hyperspectral microscopy and ICP-OES, consequently enhancing the sensitivity to radiation treatment by ~2-fold (sensitiser enhancement ratio=1.98). Importantly, this effect was underpinned by a significant increase in DNA DSB yields post-irradiation. The implant prepared by blending H-PCL, PEG and RALA:PEG-AuNP, exhibited an initial burst release, equating to approximately 20% of the total AuNP loading, followed by a slower but sustained release over two week period. Implant liberated RALA:PEG-AuNP were successfully internalised by tumour cells, confirming functional integrity. Given the move to ultra-high fractionation in the treatment of localised prostate cancer, a controlled release implant, capable of enhancing radiation sensitivity in these tumours could hold significant clinical potential. Our implant directly addresses major barriers to nanotherapy translation including effective targeted delivery, while minimising the risk of off-target accumulation. Reference: 1. Bennie, L. A.;Coulter, J. A. J Nanobiotechnology. 2021.P-279

7. Clare Mills: “Novel diagnostics to rule out bacterial infection in infants with fever”

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Sustainability Development Goals:

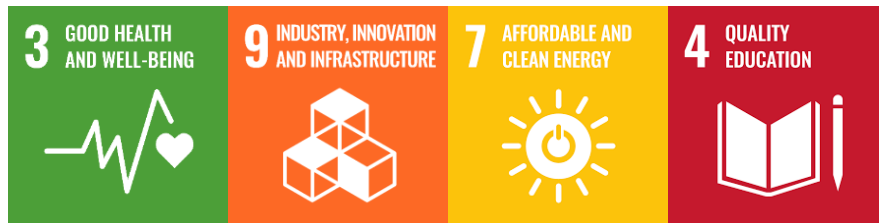


Abstract not disclosed due to confidentiality issues

8. Abraham Abraham: “Smart Reservoirs: Let's Make Smart Drug Carriers for Tomorrow”

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Sustainability Development Goals:



Abstract not disclosed due to confidentiality issues

9. Gerard Walls: “Entresto as a novel radioprotectant in a partial heart irradiation model”

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Sustainable Development Goals:



Radiation heart disease (RHD) is a critical side effect for patients with thoracic cancer. In response to stress, atrial cardiomyocytes release additional atrial natriuretic peptide (ANP), which acts on myocytes and fibroblasts of the myocardium to improve contractility and reduce harmful remodelling. As ANP is known to decrease acutely post-irradiation, we hypothesised that pharmacologically reducing its degradation may alleviate RHD. Female 8-week old C57BL/6J mice were randomly assigned to receive sham irradiation, sham irradiation plus Entresto, irradiation or irradiation plus Entresto. Irradiated mice received a 20Gy single-fraction to the superior 2/3 of the heart as a 90° arc field arrangement using a small animal radiotherapy research platform. Entresto was administered in drinking water, from one week prior until the end of the study, at a dose of 100mg/kg/day. Cardiac health was longitudinally monitored at 10-weekly intervals with transthoracic echocardiography for 30 weeks after irradiation. Plasma and tissues were collected at 30 weeks for biomarkers and immunohistochemistry respectively. Serum ANP levels were elevated and neprilysin activity levels were reduced in animals receiving Entresto, confirming expected on-target effects. Entresto was associated with cardioprotective effects as exhibited by attenuated decrements in left ventricular ejection fraction for Entresto-treated animals compared with irradiation-only animals (50% vs 40%, $p < 0.01$). Similarly, electrocardiogram parameters including PR interval duration were increased in irradiated animals, but this was not observed with the addition of Entresto (46ms vs 39ms, $p < 0.01$). Differences between the control and Entresto-only groups were not statistically significant for any parameter, and no adverse effects were noted in the Entresto-only group. Entresto was well tolerated and attenuated the RHD phenotype in long-term function and structural parameters. Further studies to confirm if Entresto can be re-purposed as a novel radioprotectant are warranted. Immunohistochemistry and spatial transcriptomic analyses are currently ongoing.

10. Thomas Thompson: “Enhancing Water Sanitation and Combating Antimicrobial Resistance”

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Sustainable Development Goals:



Antimicrobial resistance (AMR) poses a significant threat to public health and impedes efforts to maintain clean water and sanitation, aligning with the United Nations Sustainable Development Goal (SDG) 6. This research introduces plasma, particularly cold atmospheric plasma, as an innovative adjunctive therapy to antibiotics and as a method for degrading antibiotic residues in water systems, presenting significant implications for both healthcare and environmental management. We utilized sub-lethal plasma exposures on bacterial biofilms to explore synergistic effects with antibiotics, employing methodologies such as minimum inhibitory concentrations (MICs), minimum biofilm eradication concentrations (MBECs), and isothermal microcalorimetry. Additionally, the capability of plasma to degrade antibiotic residues was assessed, providing a dual approach to enhancing antimicrobial efficacy and water quality. Plasma treatment significantly enhanced antibiotic effectiveness against biofilms, evidenced by reductions in MICs and MBECs by up to 512-fold. Furthermore, preliminary results indicate a promising capability of plasma in breaking down antibiotic residues, enhancing water quality. Gene expression analysis highlighted an upregulation in oxidative stress responses, suggesting a mechanism by which plasma disrupts biofilm integrity and enhances antibiotic penetration. The integration of plasma technology in water treatment processes not only promises to mitigate AMR by bolstering antibiotic efficacy against resistant biofilms but also supports environmental health by reducing antibiotic contaminants in water systems. This study underscores the potential of incorporating plasma into standard water treatment protocols, offering a sustainable and effective solution to two pressing global issues: AMR and water sanitation.

Posters list

Poster number	Name	Poster title
1	Lucy Dillon	Pangenomics and machine learning reveal mutually exclusive routes to resistance.
2	Rina Schiller	Helping to Shape a Better World: Music as Educator, Healer, and peace-Building Social Transformer
3	Laura Cushley	Using Artificial Intelligence in Diabetic Eye Screening Programmes: Perspectives from People with Diabetes and Screening Staff in Northern Ireland
4	Yuling Xie	Human Ovarian Toxicity Models In Vitro: The Estrogen Receptor β
5	Lajos Csincsik	Retinal Vascular Changes as Potential Markers for Multiple Sclerosis: Eye as a Window to The Brain
6	Ife Bolaji	The Role of Agricultural Manure Management in Energy Production & Decarbonisation
7	Jane Burns	EXPLORING THE IMPACT OF POLYVINYLPIRROLIDONE ON SPERMATOZOA MOTILITY AND VIABILITY
8	Agnes Purwidyantri	Low-cost colorimetric sensor for nitrate pollutant detection in water
9	Niamh McKerr	Radiation and bladder function: in vivo study using a Small Animal Radiation Research Platform
10	Robyn Irwin	A Bright Future: Photodynamic Antimicrobial Polymer Films with Potential Use as Endotracheal Tube Coatings for the Prevention Of Ventilator Associated Pneumonia
11	Precious Owuamalam	Focal adhesion proteins bind RNAs in endothelial cells: understanding the functional implications.
12	Rufielyn Gravador	Method development and validation for the determination of atropine and scopolamine in foods using LC-tandem mass spectrometry
13	Jess White	Mechanical induction and long-term stability of regulatory T cells

Poster number	Name	Poster title
14	Mike Hardy	Strength in Nano-Places: Iron Nanodome Biosensors for COVID19 Prevention
15	Fatemeh Mirzadehazad	Epigenetic Reprogramming in Drug-Tolerant Persister Cells: Overcoming Chemoresistance in Colorectal Cancer
16	Leanne Bradley	Identification of novel immune activating agents for rationalised combination therapy in breast cancer
17	Laura McClenaghan	Plasma activated water pre-treatment substantially enhances phage activity against <i>Proteus mirabilis</i> biofilms.
18	Henry Hui	Data centre security amidst accelerating AI Boom
19	Sarah Baxter	Utilization of psychotropic medications among patients diagnosed with glioma: A multinational drug utilisation study

Poster Abstracts

1. Lucy Dillon: “Pangenomics and machine learning reveal mutually exclusive routes to resistance.”

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Sustainable Development Goals:



Opportunistic pathogens such as *Escherichia coli* and *Pseudomonas aeruginosa* are responsible for many antimicrobial resistance (AMR) related infections in the hospital setting. These species are accountable for many multidrug-resistant (MDR) infections, which have significantly increased over the last decade. The mechanisms of MDR are thought to be the result of plasmids and MDR genes. However, we have previously shown that AMR is more complex than the presence of a singular gene. Therefore, we want to investigate if mechanisms of resistance are mutually exclusive. We sourced 9,584 genomes of *E. coli* and 7,056 strains of *P. aeruginosa* from BV-BRC to investigate how AMR mechanisms are linked. We performed a pangenome analysis and used Coinfinder to find significantly associated or disassociated genes within the pangenome. All genomes were functionally annotated with eggNOG mapper and identified AMR genes using RGI. We made 55 decision tree models from an additional 350 strains of *E. coli* genomes. We then mapped the key genes in our decision tree models to the pangenome results. We found that the pangenomes of both *E. coli* and *P. aeruginosa* were open pangenomes, as the core genome was 0.5% for both species. We found that known AMR genes were present in both species' core genomes, including a beta-lactamase in *E. coli*. We mapped the key genes in our decision tree models to our Coinfinder results, finding matches of genes of opposite phenotypes in our Coinfinder disassociated network. We were able to find 27 gene pairs that had possible mutually exclusive mechanisms to resistance and 121 gene pairs that potentially contributed to the same AMR mechanism. These findings shed light on the complexity of AMR and MDR in *E. coli* and *P. aeruginosa*.

2. Rina Schiller: “Helping to Shape a Better World: Music as Educator, Healer, and peace-Building Social Transformer.”

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Sustainable Development Goals:



Music as Educator, Healer, and Peace-Building Social Transformer.

The beneficial effects of music are widely underestimated and frequently overlooked. Music has potential for beneficial influences on all living organisms and can effect us in many different ways. For different age groups the benefits of music can be exploited diversely to match their needs, so as to best be effective, and the same applies to different social and cultural groups within society. Music can spread a healing and calming influence at times of distress, make people prosper and grow, and it can raise awareness of the advantages of teamwork. Music can promote and support cross-cultural understanding and bolster self-confidence. Music exists in all human societies, and it accompanies us through our transitional rituals - like birthdays, weddings, and funerals - providing for celebration, inspiration, memory recall, and consolation. Music serves for communal prayer and group bonding. Music is the essential glue that holds human society together, and some analysts have suggested that the human race would likely not survive without music. The poster content will be based on my many years of ethnomusicological field research.

3. Laura Cushley: “Using Artificial Intelligence in Diabetic Eye Screening Programmes: Perspectives from People with Diabetes and Screening Staff in Northern Ireland”

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Sustainable Development Goals:



Artificial Intelligence (AI) is increasingly used in everyday life including within medical appointments. Scotland have been using AI in their diabetic eye screening programme for over 10 years. This study gathered staff and people with diabetes mellitus (PwDM) opinions on the using AI in the Northern Ireland Diabetic Eye Screening Programme. A questionnaire was distributed to all NIDESP staff and 100 PwDM. The questionnaire included questions on knowledge of AI, expectations of using AI in DESP and main concerns. Likert Scale questions were scored from 1- 10, 10 being the highest. Likert Scale and thematic analysis was undertaken. In total, 13 NIDESP staff and 13 PwDM responded. NIDESP staff felt AI would be helpful overall (average 7) but were moderately concerned about its implementation (average 6). Nearly all (92%), expected AI would help by removing ‘normal’ (ROMO) retinal images, allowing more focus on other gradings and taking pressure off staff. Despite this, 46% had patient safety concerns, 31% process efficiency concerns and several concerns with losses of personnel. PwDM were overall positive about AI with nearly all (92%) happy for AI to be implemented into DESP. PwDM felt AI could speed up results, take pressure off staff, streamline appointments, and identify eye complications. PwDM also felt it could speed up waiting times and prioritise those in need. Four patients expressed concerns surrounding safeguarding their private information and overreliance on AI. Staff and PwDM were generally positive about the implementation of AI into the NIDESP. Despite this many staff and some PwDM had several concerns around patient safety and loss of personnel. In the future it is important that both staff and PwDM opinions are considered during planning and implementation of AI and they are informed throughout the process.

4. Yuling Xie: “Human Ovarian Toxicity Models In Vitro: The Estrogen Receptor β ”

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Sustainable Development Goals:



The estrogen receptor β (ER β) is a crucial receptor widely distributed throughout the body, prominently expressed in the ovaries, uterus, mammary glands, central nervous system, and blood vessels, among other tissues. It plays a vital role in regulating female fertility, including folliculogenesis, hormones secretion, endometrial implantation, and maintenance of pregnancy. ER β also offers protection against reproductive pathologies by regulating cell growth and differentiation in reproductive tissues. Given its significance, understanding the impact of endocrine-disrupting chemicals (EDCs) on ER β is essential for female reproductive health. This study employs high content analysis (HCA) technique, using recombinant U2OS cells expressing human ER β fused to enhanced green fluorescent protein (EGFP) to investigate the effects of EDCs on ER β signalling. The assay is optimised, and applied to examine the impact of diethylstilboestrol (DES), ketoconazole (KTZ), and tetrabromobisphenol A (TBBPA) on ER β . DES, a synthetic nonsteroidal medication, exhibits a high binding affinity to ER β and induces an agonistic effect, synergizing with estradiol (E2). In contrast, KTZ, an antifungal medication, inhibits E2-induced ER β translocation without inducing an agonistic effect. TBBPA, a brominated flame retardant, shows no effect on ER β . Approximately 50 EDCs at human-relevant concentrations are tested. The findings reveal that bisphenol A (BPA) and bisphenol S (BPS) induce agonistic effects and work synergistically with E2, while certain polybrominated diphenyl ethers (PBDEs) exhibit antagonist effects. These results highlight the critical need to re-evaluate the safety of chemicals and reassess their permissible usage limits to mitigate reproductive health risks. By elucidating ER β -specific signalling pathways and their disruption by EDCs, this study provides crucial insights for toxicology and endocrine research. The findings inform regulatory decisions, enhancing public health safety by ensuring consumer protection from harmful exposures and advancing our understanding of environmental chemicals' impact on human health.

5. Lajos Csincsik: “Retinal Vascular Changes as Potential Markers for Multiple Sclerosis: Eye as a Window to The Brain”

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Sustainable Development Goals:



Multiple sclerosis (MS) is an autoimmune condition affecting the central nervous system. Research suggests that people with MS may have changes in their brain's blood vessels, potentially impacting disease progression. However, imaging brain blood vessels is challenging. Since the retina is part of the brain and can be imaged easily and inexpensively, studying retinal blood vessels might reflect changes in the brain's vessels. Understanding these retinal changes in MS could provide insights into the disease. This study examined the connection between retinal blood vessel changes and MS using various eye imaging techniques. We collected different types of retinal images from 19 healthy people and 12 people with MS. These included conventional colour fundus images, ultra-widefield images, and two types of scans (OCT and OCTA) that provide detailed pictures of the retina. We measured the size, shape, and pattern of the blood vessels in both the central and peripheral retina using specialized software. We also measured the density of blood vessels and the thickness of the choroid (a layer of the eye) using advanced imaging software. The data were analysed using R statistical packages. We found that in people with MS, the density of superficial blood vessels in the retina was lower compared to healthy people. We also found that the veins in the retina were narrower and less complex in people with MS. Additionally, the ultra-widefield images showed increased arterial width gradient in people with MS. Our findings suggest that MS is associated with changes in retinal blood vessels. Using multiple imaging techniques to study these changes could provide simple and non-invasive markers for MS. This approach might also help monitor the effectiveness of new treatments for MS.

6. Ife Bolaji: “The Role of Agricultural Manure Management in Energy Production & Decarbonisation”

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Sustainable Development Goal:



The agricultural sector in Northern Ireland was responsible for 27% of the region's greenhouse gas emissions in 2020, a significantly higher percentage compared to the rest of the UK. To mitigate the global temperature rise, it is fundamental to reduce the reliance on petrochemicals for energy, fuels, and chemicals and instead utilise biomass. One method to achieve this is through the sustainable recycling of manure in Northern Ireland, converting it into gaseous or chemical products via anaerobic digestion (AD). This process can contribute to energy decarbonisation and promote sustainable nutrient management within the agricultural sector. Addressing this issue would lead to a reduction in the environmental impact of agricultural practices by mitigating nutrient losses and accumulation in water, soil, and air. Research estimates that there is a surplus of 9.2 million tonnes of manure and 4.7 million tonnes of underutilised grass silage available in Northern Ireland, which could meet 80% of the region's natural gas demand. This study aims to identify the best strategies for integrating manure management with energy production by conducting a life cycle assessment for a centralised AD plant, producing 5 MW of biomethane from the co-digestion of slurry solid fraction and grass silage. The primary objectives of this study are to: 1) map the flow of nutrients and energy throughout the entire AD system; 2) evaluate the environmental impacts of the system; and 3) perform a cost analysis to determine the break-even cost for biomethane. The modelled integrated biomethane and digestate processing system was found to be climate neutral in comparison to natural gas and conventional fertiliser production. These findings provide valuable insights into the environmental and cost implications of transitioning from a linear, farm-centric manure management approach to a holistic and circular strategy for nutrient recovery.

7. Jane Burns: “EXPLORING THE IMPACT OF POLYVINYLPIRROLIDONE ON SPERMATOZOA MOTILITY AND VIABILITY”

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Sustainable Development Goal:



Hydrophilic catheter coatings have significantly improved chronic intermittent catheterisation and, revolutionised the management of voiding dysfunction in patients with spinal cord injury (SCI). Hydrophilic coatings absorb water resulting in a lubricious catheter surface, which is easier to insert. However, these coatings often contain polyvinylpyrrolidone (PVP), which upon dry out, leads to a sticky surface and causes coating delamination from the catheter. This results in greater friction and force required for catheter removal. Associated complications including urethral microtrauma and pain, negatively impacting patient’s quality of life. SCI is reported to predispose patients to infertility. As well as being a component in hydrophilic coatings, PVP is used in IVF to reduce spermatozoa motility. Theoretically, delamination of hydrophilic PVP-based coatings may expose sperm to PVP affecting motility and/or viability, although limited literature is available in this field. Concentrations of PVP dissolved in phosphate buffered saline (PBS) were prepared. Porcine semen was heated to 34 °C and exposed to varying concentrations of PVP solution for 15 minutes. Spermatozoa were stained with 0.4% Trypan Blue Solution and images captured at random fields of view (EVOS™ M5000 Imaging System). Spermatozoa viability was determined as the percentage of live cells in a sample image, based on dye exclusion. For motility assessment, following exposure to PVP, videos of spermatozoa were captured at random fields of view. The motility of spermatozoa ($\mu\text{m}/\text{sec}$) were assessed by ImageJ software by measuring the distance travelled by spermatozoa per second. Spermatozoa motility was significantly reduced or completely inhibited in the presence of PVP. Sperm motility of $>25 \mu\text{m}/\text{sec}$ is desirable for fertility. Spermatozoa motility and viability were adversely affected by exposure to PVP. Further research will aim to determine the potential clinical implications that this may have for PVP-coated intermittent catheter users.

8. Agnes Purwidyantri: “Low-cost colorimetric sensor for nitrate pollutant detection in water”

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Sustainable Development Goals:



Excessive nitrate levels stemming from anthropogenic, agricultural, and industrial activities pose a significant threat to surface and groundwater, sources of drinking water. Elevated nitrate concentrations have been linked with several health issues, including methemoglobinemia (blue baby syndrome), infectious disorders, and the harms to aquatic ecosystem, such as algal blooms (eutrophication) and hypoxic dead zones in coastal waterways. Besides the high-cost nitrate removal treatment, the bottleneck in nitrate detection is complex analytical testing, sampling protocols, and interferences. A rapid, portable, cost-effective, and user-friendly detection system to monitor nitrate-based water pollution is urgently required to safeguard water quality. We report on a colourimetric nitrate sensor integrating a functional polymer and a pumpless 3D-printed microfluidic (MF) chip. The self-powered chip operates without a pump and relies on capillary force with a handy size. By introducing only ~50 μL of samples and polymer to each inlet, colour differentiation was observed within one minute. The supramolecular chemistry of the functional polymer (host) and nitrate ions (guest) produces a complex that alters polymer's optical properties, shown in the colour change from dark brown to bright yellow, exploitable for dual sensing strategies; semi-quantitative naked-eye and red-green-blue (RGB) signal extraction. The sensor effectively detects nitrate with naked-eye observations feasible using dipsticks and MF chips. RGB analysis has yielded an impressive limit of detection (LoD) within the nitrate detection cutoff for drinking water. In summary, the proposed colorimetric sensor offers a promising solution for rapid, straightforward, and widely deployable nitrate detection in diverse water bodies. Additionally, its production via low-cost and reproducible 3D printing techniques presents a more environmentally sustainable alternative to clean room-based sensor fabrication.

9. Niamh McKerr: “Radiation and bladder function: in vivo study using a Small Animal Radiation Research Platform”

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Sustainable Development Goal:



Radiation therapy for pelvic malignancies unavoidably impacts the urinary bladder causing lower urinary tract symptoms in 40-50% patients (1). These include urinary frequency, urgency, nocturia, bladder irritation, and in some cases, urinary incontinence. Recent advances in pre-clinical research models of radiation include the Small Animal Radiation Research Platform (SARPP) which delivers CT-guided, defined radiation doses to rodents, mimicking the clinical setting (2, 4). The aim of the present study was to investigate SARRP-irradiation on mouse bladder voiding patterns and the ability of the bladder to contract. Adult C57BI/6 female mice received irradiation (IRR, 20Gy) to the bladder under CT-image-guided SARRP protocols. Pre- and post-IRR, mice were housed in cages for voided spot assay (VSA) of urination patterns. The number of void spots, void spot volume and void location in the cage were measured. The contractility of bladder tissue strips was assessed using in vitro tension recordings (3). Post-IRR at 2-week, 1-month and 2-month timepoints, around 50% of mice had increased void spot locations. This became less apparent at 3-month, 4-month and 6-month timepoints. Two weeks post-IRR, 50% of mice (N=13/26) had an increased number of void spots ($P<0.01$), decreased mean spot volume (N=17/26, $P<0.05$) and decreased maximum void spot volume (N=18/26, $P<0.01$). The 2-week cohort exhibited an increased number of small volume ($<50 \mu\text{l}$) spots and a reduced number of large volume void spots ($<100 \mu\text{l}$), vs. pre-IRR. Electrical field stimulation evoked neurogenic contractions in bladder tissue samples, that were significantly smaller (0.5-32 Hz) 2-weeks post-IRR, and gradually recovered to around 50% of pre-IRR amplitude at 6-month post-IRR. SARRP irradiation acutely increased the number of void spots and decreased void spot volume. This altered pattern of urination was consistent with impaired neurogenic contractions which could explain a limited ability to void.

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10. Robyn Irwin: “A Bright Future: Photodynamic Antimicrobial Polymer Films with Potential Use as Endotracheal Tube Coatings for the Prevention Of Ventilator Associated Pneumonia”

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Sustainable Development Goal:



Within nosocomial environments, antibiotic resistance is prevalent, emanating mainly from biofilm formation following medical device insertion. A notable case is the introduction of an endotracheal tube as a means of mechanical ventilation, leading to the development of ventilator associated pneumonia (VAP). Antimicrobial biomaterial coatings represent a potential strategy for mitigation. Current coatings contribute to antibiotic resistance, governed by their inability to regulate release; a large initial burst subsequently followed by continuous elution at the subtherapeutic dose. Therefore, ‘smart’ materials; capable of eliciting their antimicrobial effect upon response to exogenous or endogenous stimuli while modulating their action via on/off control are proposed. Photodynamic antimicrobial chemotherapy (PACT) employing light activated photosensitisers has shown promise. Upon irradiation, reactive oxygen species: singlet oxygen and oxygen-based radicals are produced, adopting a catalytic multi-mechanistic action; photo-oxidizing biomolecules, contributing to cell lysis and disrupting cell physiology, inhibiting bacteria growth. Correspondingly, photosensitiser loaded polymer films were fabricated, followed by microbiological characterisation with artificial sputum to assess their suitability as an endotracheal tube coating. A contact kill assay in conjunction with a repeat exposure test was performed: 100 μ L of inoculated artificial sputum was placed on the surface of a 1 cm² film and irradiated for 4 hours under red light, followed by 24 hrs incubation at 37°C. Following incubation, day 1 samples were rinsed and sonicated to remove adherent bacteria and the resultant solution plated using the Miles & Misra method. Remaining samples were reinoculated, this procedure was repeated daily until day 7. This work has eliminated the need for antibiotics and shows promise as an endotracheal tube coating, with light mediated therapy resisting attachment of bacteria up to 4 days for *P.aeruginosa* and 7 days for *S.aureus*.

11. Precious Owuamalam: “Focal adhesion proteins bind RNAs in endothelial cells: understanding the functional implications”

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Sustainable Development Goals:



The asymmetric distribution of mRNAs is a fundamental process that has been observed in various organisms, from bacteria to mammals. Correct localisation of mRNAs has been shown to be critical for blood vessel formation in endothelial cells. However, the exact molecular mechanisms responsible for mRNA targeting in endothelial cells are yet to be fully understood. Using UV cross-linking followed by orthogonal organic phase separation and Mass Spectrometry, we discovered that members of the focal adhesion complex involved in remodelling the actin cytoskeleton bind mRNAs and validated these interactions by Western blotting. To identify the mRNAs bound by these cytoskeletal proteins, we conducted RNA immunoprecipitation and high-throughput sequencing and found that some of the identified mRNAs show a strong enrichment for transcripts encoding actin-binding proteins and modulators of cell-to-cell adhesion. We hypothesize that these cytoskeletal proteins distribute mRNAs during angiogenesis and endothelial barrier function. Our current investigations are aimed at determining the spatial distributions of these enriched transcripts within endothelial cells and to assess whether their spatial distributions would result from direct interactions with the focal adhesion proteins. The results from our studies will uncover previously unappreciated roles of cytoskeletal remodelling proteins in RNA localisation, and the gained knowledge will be beneficial in precision medicine for treating vascular-related pathologies and other cellular disorders.

12. Rufielyn Gravador: “Method development and validation for the determination of atropine and scopolamine in foods using LC-tandem mass spectrometry”

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Sustainable Development Goal:



Atropine and scopolamine are tropane alkaloids (TAs) whose presence in food has been regulated due to their adverse effects on consumers, which can lead to death. Most reported poisoning outbreaks following consumption of food contaminated by TAs were due to the seeds of *Datura stramonium*, an invasive weed from the Solanaceae family. These plants grow among crops and can be accidentally co-harvested and processed along with food crops. This study aimed to develop and validate an ultrasound-assisted solid-liquid extraction alongside dilute-and-shoot to extract and quantify both atropine and scopolamine in cereal (corn) and oilseed (soybean). One gram of homogenised sample extracted with acetonitrile: water (60:40) with 1% formic acid, mixed for 90 min, ultrasonicated for 30 min, centrifuged, and the supernatant diluted, filtered, and injected into a liquid chromatography-tandem mass spectrometry (LC-MS/MS) triple quadrupole system. The limit of detection (LOD) and quantification (LOQ) for atropine were 0.03 and 0.10 $\mu\text{g kg}^{-1}$, and for scopolamine, they were 0.13 and 0.25 $\mu\text{g kg}^{-1}$, respectively. The extraction recovery for all matrices was within 70- 120%, and intra- and inter-day precision (expressed as relative standard deviation) were < 15% at 1, 5, and 50 $\mu\text{g kg}^{-1}$ for atropine and scopolamine. The matrix effect was $\leq 20\%$, except for scopolamine in the sorghum matrix (30%). The linearity range was from 0.05- 100 $\mu\text{g kg}^{-1}$ and had a coefficient of determination of over >0.99. The validation parameters showed suitability for measuring atropine and scopolamine at maximum residue levels of 1-15 $\mu\text{g kg}^{-1}$ for certain food commodities (some cereals and derived products). Moreover, the current extraction method with a dilute-and-shoot step showed flexibility in obtaining a clean extract for accurate LC-MS/MS quantification with high throughput. It was simple to execute at an economical cost.

13. Jess White “Mechanical induction and long-term stability of regulatory T cells”

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Sustainable Development Goal:



Multiple sclerosis (MS) is an immune-mediated, demyelinating disease of the central nervous system (CNS), affecting over 2.5 million people worldwide. While there are no remyelinating therapies available, regulatory T cells (Treg) have been shown to promote myelin regeneration in the CNS. As such, the induction/expansion of Treg is a therapeutic goal for MS. It has recently emerged that the induction of Treg is dependent on the mechano-sensitive calcium channel, *piezo1*, and may be mechanically controlled. To investigate this, we employed a joint experimental-computational approach to uncover potential mechanisms for MS immunotherapy. Whole CD4⁺ T cells were isolated from the spleens of WT mice and cultured on polyacrylamide gels (PA) of varying stiffness in the presence of anti-CD3, anti-CD28, TGF- β , anti-IFN- γ , and IL-2. Treg cell area, calcium influx, and FOXP3 expression were analysed and applied to a computational model examining Treg induction and long-term stability. We observed that PA gel drives the activation and differentiation of FOXP3⁺ Treg in vitro. Together, with the computation model, we found Treg induction to be a biphasic response to substrate rigidity, involving the catch slip behaviour of the anti-CD3-TCR complex, calcium influx, and nucleus shape. Preliminary results also showed mechanically induced Treg demonstrate an increased stability of FOXP3 expression for 6 days in vitro. This study uncovered a novel mechanism involved in the mechano-sensitive induction and potential stability of FOXP3⁺ Treg. Ongoing work is now investigating whether mechanically induced Treg improve the efficacy of remyelination in vitro, which may hold promise for developing immunotherapies and improving outcomes for MS patients.

14. Mike Hardy “Strength in Nano-Places: Iron Nanodome Biosensors for COVID19 Prevention”

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Sustainable Development Goal:



Nanoimprint Lithography (NIL) is promising tool in biosensor fabrication, which can lower the cost per measurement, by using a scalable stamping process [1]. However, NIL often lacks fidelity between the template and the final structure, which is a hindrance towards use in quantification in analytical studies. Here, we look at how flat the sensing surface is via white light spectroscopy in a transmission set-up. Principal component analysis, which is an unsupervised machine learning technique that can find small differences in many variable datasets, was performed over a range of 0-1°. Confidence ellipses overlapped signifying (at $p=0.05$) that the performance of the sensor is insensitive to small imperfections in flatness profile up to 1° in planar angle misalignment. However, plane angle mismatch of up to 10° was also investigated showing clear differences. Thus, for optimal sensitivity incident light should interact with the substrate plane $<4^\circ$. Raman spectroscopy is an analytical technique that provides a ‘molecular fingerprint’ of a target molecule, and whose signal can be boosted when the molecules are close to metal-coated nanostructures. Here, the sensor signal uniformity was evaluated at a relative standard deviation of 13% via Raman spectroscopy mapping of gelatine (a mucal lining approximation) and gellan fluid ($n=10$), which has promise as a nasal spray constituent to combat SARS-CoV2 infection. The substrate is iron-metallised for prospective application in the emerging area of bio-magneto-plasmonics. While the current study looks at periodic nanostructure arrays it is potentially generally applicable to nanostructure platforms with different kinds of imperfections. This work lays the foundation for the development of more reliable biosensors for quantitative study.

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15. Fatemeh Mirzadehazad “Epigenetic Reprogramming in Drug-Tolerant Persister Cells: Overcoming Chemoresistance in Colorectal Cancer”

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Sustainable Development Goals:



The development of drug-tolerant persister (DTP) cells poses a significant challenge in colorectal cancer (CRC) treatment, particularly with 5-fluorouracil (5-FU)-based chemotherapy that is the standard-of-care treatment in CRC. However the epigenetic adaptation underlying DTP formation remains less understood. Here, we establish an in vitro model for DTP formation, showing that DTPs' resistance to 5-FU is reversible and that 5-FU-tolerant cells exhibit multidrug resistance. This underscores the need to identify novel therapeutic targets in DTPs. Our research revealed that DTPs undergo a profound epigenetic reprogramming, suggesting that targeting epigenetic vulnerabilities may provide a promising strategy to eliminate DTP cells. Using time resolved epigenetic profiling, we show that DTPs gain activity at cis-regulatory elements that are enriched with TEAD and AP-1 motifs and upregulate revival stem cell and inflammation transcriptional programs. Accordingly, we demonstrate that inhibiting TEAD transcription factors significantly impairs DTP formation, supporting their potential as therapeutic targets. In line with the observed reprogramming of transcriptional enhancers, we noted a significant change in YAP1-TAZ signalling associated with DTP formation. Our research on characterizing the epigenetic landscape in DTPs provides a foundation for developing effective strategies to prevent or overcome chemotherapy resistance and tumour relapse in CRC.

16. Leanne Bradley “Identification of novel immune activating agents for rationalised combination therapy in breast cancer”

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Sustainable Development Goals:



The DNA-damage immune-response (DDIR) is an immune-driven gene expression signature that has been identified in several cancer types. Mechanistically, the DDIR signature is mediated by activation of the nucleic acid sensing cGAS/STING signalling pathway following genomic instability and resulting in a classical type I interferon response with activation of immune checkpoint signalling. DDIR signature status has been found to be predictive of response to anthracycline-based therapy in breast cancer, with DDIR-positive patients displaying favourable outcomes regardless of traditionally classified molecular subtype, demonstrating the utility of this signature as a predictive biomarker. Furthermore, DDIR-positive breast tumours displayed increased presence of tumour infiltrating lymphocytes (TILs) and upregulation of various immune checkpoint genes including PD-L1, CTLA-4 and TIM3 and, therefore, may be responsive to immune checkpoint therapy. Indeed, metastatic triple negative breast cancers, which are considered relatively ‘hot’ in the context of other breast cancers, have shown increased responsiveness to the combination of atezolizumab with nab-paclitaxel (IMpassion130 trial), highlighting the potential benefits of developing ICB therapies for breast cancer patients. Given the improved outcomes observed for DDIR-positive patients, we hypothesised that ‘conversion’ of DDIR-negative tumours may lead to improved responses in those patients. Furthermore, activation of the DDIR signature may lead to increased TIL infiltration into these DDIR-negative, ‘cold’ tumours, and thus expand the potential therapeutic benefits of ICB therapies for a wider range of breast cancer patients. We propose to ‘convert’ DDIR-negative tumours by identifying novel immune activating agents that could be combined with standard of care chemotherapy to improve patient responses and to potentially explore rationalised ICB combinations. Our data demonstrates the ability to activate innate immune signalling using currently

approved drugs, providing a promising foundation to further explore repurposing these compounds for therapeutic benefit in breast cancer.

17. Laura McClenaghan “Plasma activated water pre-treatment substantially enhances phage activity against *Proteus mirabilis* biofilms.”

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Sustainable Development Goal:



The integration of cold plasma technology and bacteriophage therapy is a formidable strategy against the biofilm-forming *Proteus mirabilis*, especially pertinent in urinary tract infections (UTIs) linked with long-term urinary catheter use. Our study investigates the synergistic effects of bacteriophages and plasma activated water (PAW) in targeting the biofilms of *P. mirabilis*. The study encompasses two objectives: the first is to determine the interactive dynamics between bacteriophages and ROS/RNS when applied to biofilms - whether these interactions are synergistic, enhancing the biofilm eradication, or antagonistic, detracting from their individual effectiveness. The second objective is to explore how the variations in plasma discharge parameters, such as strength and design, influence the antimicrobial efficacy of PAW. By conducting this dual-focused inquiry, we aim to shed light on the potential of leveraging bacteriophages and PAW in concert to overcome the formidable defence mechanisms of *P. mirabilis* biofilms, thereby contributing to the development of more effective strategies for infection control and antimicrobial resistance mitigation. Generated through a specialised non-thermal or cold plasma discharge setup, PAW is composed of an array of reactive oxygen and nitrogen species (ROS/RNS), well described for their antimicrobial capabilities. Additionally, bacteriophages have gained a recent resurgence, with their bacterial strain specificity, present as viable bio-control agents. Our study explored the interaction between bacteriophages and ROS/RNS on biofilm eradication and assessed the impact of different discharge setups on the antimicrobial efficacy of PAW. The stability of phage vB_PmiS_PM-CJR in PAW, alongside the susceptibility of both planktonic and biofilm cultures to PAW, was assessed, offering critical insights for enhanced antimicrobial strategies.

The sequential application of PAW followed by phage significantly reduced biofilm biomass and bacterial load; the reverse order (phage followed by PAW) did not show

better antibacterial effects compared to using PAW or phage alone. We hypothesise that PAW can disrupt biofilm structures, thus enhancing phage penetration and bactericidal action. The synergy unveiled between cold plasma and bacteriophages offers a broader view for tackling biofilm-associated infections in clinical settings and is a promising pathway towards not only managing UTIs associated with *P. mirabilis* but also mitigating the broader antibiotic resistance quandary.

18. Henry Hui: “Data centre security amidst accelerating AI Boom”

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Sustainable Development Goals:



Cyber security has been one of the biggest challenges for data centres across the globe. The recent boom in Machine Learning (ML) and Artificial Intelligence (AI) have accelerated the adaptation of various forms of machine-driven security solutions, e.g. ML-assisted security alerts and Network based intrusion detection systems (NIDS). However, most of the rapid adaptations are not necessarily caused by the maturity of the technologies but instead by their popularity. Inefficiency hence became a significant issue in data centres. Extra computation (and hence electric) power is consumed by AI deployment on security systems while producing significant false/miss alerts. Meanwhile, data centres are combating attacks that are increasing automated using the very same technologies. Therefore, with the aid of cutting edge Nvidia technologies like Graphics Processing Units (GPU) and Data Processing Units (DPU), this project aims to provide a systematic approach that can efficiently deploy AI/ML for attacks detection without the huge power and computational cost while achieving high detection accuracy to protect data centres, and eventually, the end users. This project is hosted in the Cyber-AI hub, QUB, with Nvidia as an industrial part

19. Sarah Baxter: “Utilization of psychotropic medications among patients diagnosed with glioma: A multinational drug utilisation study”

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Sustainable Development Goal:



Cancer patients are commonly prescribed psychotropic drugs. Psychiatric comorbid conditions are well documented in patients with glioma and considerable overlap exists between the symptoms of glioma and psychiatric conditions. However, little is known about the use of psychotropic medications in these patients. We aimed to describe psychotropic drug utilization among patients with glioma, compared to cancer-free individuals in four European countries. Data sources included the Secured Anonymised Information Linkage (SAIL) Databank from Wales (2000-2018) and nationwide health registries from Denmark (2001-2018), Sweden (2006-2020) and Norway (2004-2021). All incident glioma cases were matched to a cancer-free comparison cohort on age and sex. We calculated rates of new psychotropic prescriptions and total (new and prevalent use) psychotropic prescriptions during the two years prior and post glioma diagnosis date. Analyses were stratified by histological subtypes and subclasses of psychotropic medications. In total, we identified 16,388 glioma patients. The rate of new psychotropic prescriptions increased starting from seven months before diagnosis and peaked at the month of diagnosis in patients with glioma in all datasets with incidence rates ranging from 221 prescriptions per 1000 persons per month in Wales to 755 prescriptions per 1000 persons per month in Sweden. The rate of new psychotropic prescriptions remained substantially higher among glioma cases than controls throughout the 2-year follow-up period after glioma diagnosis, though, rates of new use continued to decline throughout. Rates in new and total psychotropic prescriptions varied between drug classes, with the highest new use rates observed for antiepileptics (highest rate observed in Sweden at 391 prescriptions per 1000 persons per month), which appeared to be the main driver of overall utilization patterns. Although overall patterns were similar when analyses were stratified by histological subtype, patterns were more pronounced for patients with diffuse astrocytoma, with the highest rates of new psychotropic treatment

observed in this group (highest rate observed in Sweden at 1,008 prescriptions per 1000 persons per month).