



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

TRINITY CENTRE FOR BIOMEDICAL ENGINEERING

ANNUAL

REPORT

2022 - 2023

*Promoting Excellence in Biomedical Engineering Research,
Education & Next Generation Medical Devices.*

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TRÍONA LALLY

Director of Trinity Centre for Biomedical Engineering



Welcome to the 2022/23 annual report of the Trinity Centre for Biomedical Engineering. The report aims to highlight all the key educational and research activities of the Principal Investigators (PIs), postdoctoral researchers, students and staff associated with the Centre. During 2022/23, TCBE has continued to grow, welcoming new PIs and researchers to the Centre where we have collaborated and shared our knowledge with the common goal of promoting excellence in Biomedical Engineering.

The centre has continued to expand in terms of researchers and research funding, including securing a number of further European Research Council (ERC) grants which are a real metric of success. This reflects the strength of research within the TCBE and highlights Biomedical Engineering as a key institutional and national research strength.

This year saw us showcase our research at our inaugural *TCBE Research Showcase* in December 2022 which was a great success. Researchers presented talks and posters across a broad range of research themes, with leading clinicians invited to share their clinical challenges. The talks showcased research on medical device development in cardiovascular and orthopaedics where researchers shared their journeys from 'bench-to-bedside'.

We celebrated a new cohort of MSc and MAI students graduating from our Biomedical degree programmes and also saw 5 PhD students complete their PhD programmes.

All of these successes are due to all the hard work of the PIs in the Trinity Centre for Biomedical Engineering and I thank them for their enthusiasm and commitment to TCBE. I hope you enjoy reading our annual report and can appreciate the impact of the work done by those operating within the centre.

Tríona Lally

2022 - 2023 GENERAL HIGHLIGHTS

First TCBE research showcase held in December 2022 bringing together all TCBE PIs and researchers to showcase their research to one another and further enhance collaboration.



TCBE PI Dr. Oran Kennedy (RCSI) chaired the 2023 BioEngineering in Ireland conference with Dr. Claire Conway (RCSI) as co-chair.

Danny Kelly awarded the prestigious TERMIS midterm career award

Prof. Michael Monahan awarded the prestigious TERMIS early-term career award

Prof. Fergal O'Brien (RCSI) awarded the ORS Marshall Urist Award

Professor Reilly was appointed Director of the charity Dublin Neurology Institute at the Mater Hospital to increase clinical biomedical engineering research activities for the benefit of patients.

Professor Reilly was nominated to the ExCom of the IEEE Engineering and Medicine and Biology Society and the IEEE Technical Committee on Biomedical Engineering Education.

Professor Reilly sought and was granted approval from Trinity College for a new MSc in Regulatory Affairs in Medical Devices. Associate Professor Tom Melvin was appointed in 2022 to lead this program, which had its first intake of students in October 2023.

2022 - 2023 GENERAL HIGHLIGHTS (CONTINUED)



Professor Reilly was co-Chair of an international Dystonia Research Symposium in Dublin in June 2023. This meeting brought international clinical experts to Dublin to discuss the latest findings in Dystonia Research. TCBE PhD, MAI and MSc biomedical students presented posters. In cooperation with Dystonia Ireland a 'meet the expert' day was also organised for Irish dystonia patients to hear from international clinical experts.

Dr. Eoin O Cearbhaill (UCD) awarded 2023 nova UCD innovation champion of the year award Prof. Fergal O'Brien elected as Fellow to the Irish Academy of Engineering based on track record in leadership and scholarly output 2022.

Prof. Fergal O'Brien included on Stanford's updated 2022 list of the world's 2% most widely cited scientists, the 'World's Top 2% Scientists'.

2022 - 2023 GENERAL HIGHLIGHTS (CONTINUED)

Professor David Hoey attended the Orthopaedic Research Society, Dallas, US, 2023: This is the largest and most prestigious basic science orthopaedics conference in the world. Prof. David Hoey along with Prof. McNamara of NUIG and Prof. O'Brien of RCSI, were invited to represent Ireland as the 'Guest Nation' at the 2023 meeting, a significant honour for our country.

Festschrift Event (01/09/2022): To honour the retirement of Prof. David Taylor from the Faculty of STEM, David Hoey organised a conference which featured talks from current/former staff and alumni demonstrating his contribution to TCD and his profession. Working with Trinity Development & Alumni this event attracted >150 people onto campus from around the world. In addition, he produced a book (Festschrift) in his honour which was contributed to from many current and former members of TCBE and was distributed to all attendees. They also organised an Art Exhibit of Prof. Taylors recent paintings. Proceeds of the book and artwork were donated to the TCD Student Hardship Fund (>€1200).

Professor David Hoey organised a showcase of Biomedical Engineering Research in Front Square for European Researchers Night which saw a significant number of visitors of all ages.

Professor Conor Buckley awarded Top Cited Article, Journal of Orthopaedic Research-Spine (2021-2022). Investigating the physiological relevance of ex vivo disc organ culture nutrient microenvironments using in-silico modelling and experimental validation. JOR Spine 4(2):e1141, 2021. Contribution- Senior Author Trinity College Dublin Innovation Awards 2022. In recognition of achieving Campus Company Status (Altach Biomedical). Contribution- Co-Founder

The Buckley Lab in collaboration with the SFI Advanced Materials and Bioengineering Research (AMBER) Centre hosted and trained 15 researchers from Necmettin Erbakan University, Turkey from the 14th to 16th June 2023. Our team developed a technical training activity as part of the REGENEU programme (HORIZON-WIDERA-2021-ACCESS-03 (2022-2025)) which is led by Prof. Buckley at TCD. Technical training topics included: Preparation of extracellular matrix (ECM) hydrogels, 3D Printing ECM and graphene, 3D Printing Gel-MA logo and effects of freeze drying to impart porosity, Electrospinning, Melt electrowriting (MEW) and Encapsulation of cells into a hydrogel and assessment via a Live/Dead® assay.



2022 - 2023 GENERAL HIGHLIGHTS (CONTINUED)

The Buckley lab hosted 17 TY students to explain the type of research that is performed in my lab. The students were given an introduction to the intervertebral disc and the strategies we are implementing to combat its degeneration, including injectable biomaterials, 3D printing, and cell culture techniques.



The Buckley lab was awarded a Trinity College Dublin Innovation Awards 2022. In recognition of achieving Campus Company Status (Altach Biomedical). Contribution- Co-Founder.

Prof. Lally was recognised as "One to Watch" at the Trinity College Dublin Innovation Awards 2022

GRANTS

Dr. Fiona Freeman (UCD)

Dr. Fiona Freeman (UCD) awarded ERC Starter Grant, META-CHIP (GA#101118002, €1,499,884) from Horizon Europe. The development of a lung METAstasis-on-a-CHIP model for osteosarcoma as a biomimetic testing platform for drug discovery and therapeutic innovation.

EORS/ON Grant

Named a Top Innovator under 35 from MIT Technology Review.

Prof. Triona Lally

ERC PoC €150k

IRC/Boston Scientific Enterprise Partnership PhD awarded to Luke Guerin €150k

AMBER CDT PhD awarded to Francesco Digeronimo €150k

Dr. Mark Aherne

Irish Research consolidator Laureate Grant €600k

Prof. Danny Kelly

Co-Principal Investigator – SFI Frontiers for the Future (2023 – 2028) €1,000,000

Project title: Engineering structurally anisotropic and mechanically functional musculoskeletal tissues by guiding the fusion, differentiation and (re)modelling of stem cell derived cartilage spheroids (22/FFP-A/11042).

Description: This project will build upon applicant's extensive expertise in bioprinting and bioink development to produce a new biofabrication platform that provides physical boundaries, matrix (re)modelling factors and spatiotemporally defined patterns of growth factors to self-organizing cellular aggregates, microtissues or organoids.

Principal Investigator – European Research Council Proof of Concept (2023-2025) €150,000
Project title: Melt Electrowriting of Multi-layered Scaffolds for osteochondral defect repair (101137852; MEMS)

Description: The MEMS project aims to enhance the regenerative capacity of melt electrowritten scaffolds by (i) optimising their architecture, and (ii) functionalizing their surface with extracellular matrix (ECM) components supportive of tissue-specific regeneration. The output of MEMS will be an off-the-shelf implant capable of directing joint regeneration without the need for delivering exogenous cells to the defect site.



GRANTS (CONTINUED)

Prof. Ciaran Simms

Co-applicant in TCD AIM CP awards: [AIM CP Project - Medicine | Trinity College Dublin \(tcd.ie\)](#)
Awarded €225k from EI Comm Fund for KineMo trials.

Dr. Ciara Murphy

ERC CoG (Regenerative Stenting for Osteoporotic Vertebral Fracture Repair - €2,039,473).

Prof. Michael Monaghan:

ERC-CoG 2023: 2.57 €Million

https://www.tcd.ie/news_events/articles/2023/trinity-pair-win-european-research-council-erc-consolidator-grants/

2023 Naughton Faculty Fellowship

<https://naughton.nd.edu/news-and-social/news/2023-naughton-fellowships-awarded-to-31-students-and-faculty/>

Dr. Eoin O Cearbhaill (UCD)

The Development of an Antimigration Coating for Gastrointestinal Stents
Irish Research Council (IRC) 1 Sep 2023 - 31 Aug 2025

A preclinically validated solution to enable treatment of >90% of patients with Tricuspid Regurgitation (with CroiValve)
DTIF/Enterprise Ireland (EI) 1 Mar 2023 - 28 Feb 2026

AURIN platform (NEUROPAUSE medical): A medical device for the treatment of menopausal vasomotor symptoms (hot flushes and night sweats)
Enterprise Ireland (EI) 9 Feb 2023 - 8 Feb 2024

Prof. Fergal O'Brien (RCSI)

O'Brien, F.J., Gene-activated scaffolds for the treatment of Epidermolysis Bullosa. 6 months.
Seed Funding from DEBRA Ireland.
Total funding awarded: €20,000.

O'Brien, F.J., Matheson, A. (main applicant). ON Foundation Kickstarter grant- 'Parathyroid hormone-1-34 Gene-activated Scaffolds for Augmented Healing of Osteoporotic Bone fractures' Orthoregeneration network/ICRS (Travelling Fellow).
Total Funding Awarded: 10,000 CHF.

O'Brien, F.J., Matheson, A. (main applicant). Delivering mRNA: Gene Activated Biomaterials for Cartilage Tissue Engineering. NSERC fellowship. May 2023-April 2025.
Funding awarded: €81,860.

Functionalizing Next Generation Nerve Regeneration Biomaterials with Electrical Stimulation and Gene Therapy. RCSI StAR PhD Programme (Fulbright), applicant: Julia Burke, Supervisor: Prof. Fergal J. O'Brien.
Total Funding Awarded: €167,000. 2023-2027.

GRANTS (CONTINUED)

The application of 3D printed biomaterials for the delivery of therapeutics to enhance cartilage repair and reduce inflammation in joint defects. StAR International Programme, collaboration with Soochow University (Student: Shan An, supervisor: Fergal O'Brien, Yiran Zheng). 2022-2026.

Funding allocated €20,000

Collaboration between RCSI and Bruin Biometrics LLC, 'Verification and validation of the Provisio SEM Scanner's operational claims in a clinical skin tissue model.' Declan Patton (PI), Fergal J. O'Brien (co-applicant).

Total funding awarded: November 2021-February 2025.

Funding awarded: €138,247. Fergal: €45,846

Irish Research Council (IRC) GoI Postgraduate Scholarship, 'Non-viral targeting of cell junctional proteins to destabilise fibroglial scar after SCI'. Stasiewicz M (PhD scholar), O'Brien FJ (PI). 2022-2023 (12 Months).

Total funding awarded: 27,500 (+ 10,000 from RCSI Co-Fund). GOIPG-2022-2423 (IRC); GOIPG-2022-2423 (RCSI). September 1st 2022.

Prof. Conor Buckley:

Principal Investigator– HORIZON-WIDERA-2021-ACCESS-03 (2022-2025) €1,446,071. Amount to PI: €173,820

Project title: Consolidating the Expertise of Necmettin Erbakan University Towards the Development of Biofibers for Wound Healing and Tissue Regeneration (REGENEU)

Description: The proposal REGENEU aims to meet the requirements of the HORIZON-WIDERA-2021-ACCESS-03-01: Twinning Call. The main focus of this project is to increase the scientific capabilities and excellence of NEU in the field of biofiber research and development for translational application. This target is supported by European partners TLC-RT (Germany), TERM (Germany) and AMBER of the University of Dublin, Trinity College Dublin (Ireland).

Funded by: HORIZON-CSA

Grant ID: 101079123

Principal Investigator – Irish Research Council (IRC) - Government of Ireland Postgraduate Scholarship Scheme (2022-2026) €110,000

Project title: The Oestrogen-Adipokine Axis and Its Influence on Vertebral Cartilaginous End-Plate Calcification and Porosity Formation in Pre-Menopausal Females



GRANTS (CONTINUED)

Funded by: Irish Research Council.
Grant ID: GOIPG/2022/2078

Prof. David Hoey:

€242,476.20 – Marie Skłodowska Curie Actions Postdoctoral fellowship entitled “METABOLic immuno-engineered biomATERials” 2023

€358,470 – Health Research Board entitled “Stromal cell subtypes define distinct pathogenesis in RA and PsA”. 2022. Co-applicant with Prof. Daniel Kelly. Lead application: Prof. Ursula Fearon.



TCBE SEMINARS

Controlling the Assembly of Biomaterials and Engineered Tissues

Dr James Armstrong, Translational Health Sciences, Bristol Medical School, Bristol, UK.

Bioprinting Models for Heart Organ Development and Disease

Dr Andrew Daly, Assistant Professor in Biomedical Engineering (Biomaterials), University of Galway, Ireland.

Intervertebral Disk Regenerative Medicine: Moving from Animal Models to Clinical Trials

Dr Catherine Le Visage, Research Director and Deputy Director of the Regenerative Medicine and Skeleton Lab in Nantes, France.

Collaborative Research, Mathematical Modeling, and Bioengineering

Professor Martin Tanaka, Professor of Mechanical Engineering at Western Carolina University, USA.

Synthesis and Applications of Silk-Inspired Materials

R. Helen Zha, Assistant Professor, Department of Chemical and Biological Engineering, Rensselaer Polytechnic Institute, New York, USA.

Recapitulating Complex Human Tissues using Organ-on-Chip and Organoid Technologies

Professor Peter Loskill, W3-Professor for Organ-on-Chip Research at Eberhard Karls University, Tübingen, Germany



TCD TCBE PHD STUDENT VIVAS/GRADUATIONS

Dr. Nuno Neto from the Monaghan lab

Dr. Xavi Barceló from the Kelly lab

Dr. Emily McDonnell from the Buckely lab

Dr. Rob Johnston from the Lally lab

Dr. Brooke Tornifoglio from the Lally lab

Dr. Angelica Federi from the Hoey lab

PHD/TCBE RESEARCHER HIGHLIGHTS

Dr. Brooke Tornifoglio wins best presentation prize at the British and Irish Chapter of MRM in September 2022

Dr. Niall Linnane Wins The Charles S. Kleinman Scholarship Award - September 2022

Aoife Glynn wins BINI presentation award in January 2023.

Luke Guerin and **Aoife Glynn** win 1st and 2nd prize poster awards at Bernard Crossland symposium September 2023

Third year undergraduate Biomedical design team "Pilldora" win the NDA Student Universal Design Grand Challenge

PHD/TCBE RESEARCHER HIGHLIGHTS

- **Tara Ní Néill, 2023.** Awarded first prize (oral presentation: Screening of Regenerative microRNAs in the Nucleus Pulposus of the Intervertebral Disc using Cell Penetrating Peptide Delivery) at the Tissue Engineering and Regenerative Medicine International Society (TERMIS), European Chapter Meeting, Manchester, United Kingdom from 28th to 31st March 2023. Tara's work focuses on cell penetrating peptide and microRNA delivery for intervertebral disc regeneration. *Contribution- Senior Author*
- **Jake McDonnell, 2023.** Awarded Medtronic Best Research Mechanobiology Oral Presentation, Early Career Researcher award. 28th Annual Conference of the Section of Bioengineering of the Royal Academy of Medicine in Ireland, Johnstown Estate Hotel & Spa, Enfield, Co. Meath from 26th — 27th January 2023. *Contribution- Senior Author*



- **Isabelle Imhof, 2023.** Awarded Medtronic Best Biomaterials Research Oral Presentation, Early Career Researcher award. 28th Annual Conference of the Section of Bioengineering of the Royal Academy of Medicine in Ireland, Johnstown Estate Hotel & Spa, Enfield, Co. Meath from 26th — 27th January 2023. *Contribution- Senior Author*
- **Emily McDonnell 2022.** Best poster award in Applied Biomaterials. Trinity Centre for Biomedical Engineering Annual Research Day, 6th Dec 2022. *Contribution- Senior Author*
- **Tara Ní Néill, 2022.** Recipient of ORS PSRS Best Podium Award for Outstanding Scientific Research in the Next Generation Treatments category. ORS PSRS 6th International Spine Research Symposium November 6 – 10, 2022 Skytop Lodge, Skytop, Pennsylvania, USA. *Contribution- Senior Author*
- **Niamh Wilson, 2022.** Recipient of the ORS PSRS Best Poster Award for Outstanding Scientific Research in the Development and Homeostasis category. ORS PSRS 6th International Spine Research Symposium November 6 – 10, 2022 Skytop Lodge, Skytop, Pennsylvania, USA. *Contribution- Senior Author*
- **Lianne Shanley** co-supervised by **Prof Danny Kelly** awarded the RAMI bronze medal for best scientific presentation at BINI 2023.

PHD/TCBE RESEARCHER HIGHLIGHTS CONTINUED

- **Rosario Milazzo, 2023.** Senior author on poster awarded 3rd prize at the Trinity Centre for Biomedical Engineering Research Day, Dublin, Ireland.
- **Mimma Maggio, 2023.** Senior author on paper awarded 1st prize in the 'Mechanobiology' section at the Bioengineering in Ireland Conference, Enfield, Ireland.
- **Ms. Mimma Maggio, 2022.** Senior author on poster awarded 1st prize in the 'Orthopaedics' section at the Trinity Centre for Biomedical Engineering Research Day, Dublin, Ireland.
- **Stephane Petrousek, 2022.** Senior author on talk awarded 1st prize in the 'Orthopaedics' section at the Trinity Centre for Biomedical Engineering Research Day, Dublin, Ireland.



- **Ms. Morgan Cobban, 2022.** Senior author on paper awarded 1st prize in the 'Mechanobiology' section (Early Career) at the Bioengineering in Ireland Conference, Galway, Ireland.
- **Ms. Mimma Maggio, 2022.** Senior author on paper awarded 1st prize in the 'Regenerative Medicine' section (Early Career) at the Bioengineering in Ireland Conference, Galway, Ireland.
- **Stephane Petrousek, 2022.** Senior author on paper awarded 2nd prize in the 'Mechanobiology' section at the Bioengineering in Ireland Conference, Dublin, Ireland. Awarded to Stephane Petrousek, 2022.
- **Dr. Nidal Khatib, 2022.** Co-author on paper awarded the New Investigator Recognition Award at the Orthopaedic Research Society Meeting.



TRINITY CENTRE FOR BIOMEDICAL ENGINEERING PAPERS

Dr. Claire Conway and Dr. Amir Hameed

Antony I, Mehari Abraha H, Hameed A, Conway C. A European update on transcatheter aortic valve implantation (TAVI) in the COVID era. *Journal of Anatomy* 2023;242(1):50–63.

<https://doi.org/10.1111/joa.13740>.

Dr. Fiona Freeman

F.E. Freeman, P. Dosta, L.C Shanley, N. Ramirez Tamez, C.J. Riojas Javelly, O.R. Mahon, D.J. Kelly and N. Artzi. “Localized nanoparticle-mediated delivery of miR-29b normalises the dysregulation of bone homeostasis caused by osteosarcoma whilst simultaneously inhibiting tumour growth”, *Advanced Materials*, 2023

Prof. Tríona Lally

B Tornifoglio, RD Johnston, AJ Stone, C Kerskens, C Lally, Microstructural and mechanical insight into atherosclerotic plaques: an ex vivo DTI study to better assess plaque vulnerability. *Biomechanics and Modeling in Mechanobiology* 22 (5), 1515-1530,6, 2023.

M Laffey, B Tornifoglio, C Lally, Development and Initial Characterisation of a Localised Elastin Degradation Ex Vivo Porcine Aortic Aneurysm Model, *Applied Sciences* 13 (17), 9894, 2023.

S Bose, B Fereidoonzehad, M Akbarzadeh Khorshidi, Brian Watschke, Evania Mareena, Daragh Nolan, Sean Cooney, Ivor M Cullen, Caitríona Lally. The role of tissue biomechanics in the implantation and performance of inflatable penile prostheses: current state of the art and future perspective. *Sexual medicine reviews* 11 (3), 268-277, 5, 2023.

A Hanly, RD Johnston, C Lemass, A Jose, B Tornifoglio, C Lally, Phosphotungstic acid (PTA) preferentially binds to collagen-rich regions of porcine carotid arteries and human atherosclerotic plaques observed using contrast enhanced microCT. *Frontiers in Physiology* 14, 1057394, 6, 2023.

C. O’Keeffe, D. Taylor, C. Lally, D.J. Kelly, Morphological induced improvements in the bulk mechanical properties of chemically etched additively manufactured Ti-6Al-4V micro-struts, *Additive Manufacturing* 75, 103748, 3, 2023

RD Johnston, M Ghasemi, C Lally. Inverse material parameter estimation of patient-specific finite element models at the carotid bifurcation: The impact of excluding the zero-pressure configuration and residual stress, *International Journal for Numerical Methods in Biomedical Engineering* 39, 2023.



TRINITY CENTRE FOR BIOMEDICAL ENGINEERING PAPERS (CONTINUED)

RE Levey, B Tornifoglio, AJ Stone, C Kerskens, ST Robinson, FB Coulter, Robert Bagnall, Raymond O'Connor, Eimear B Dolan, Peter Dockery, Gabriella Bellavia, Stefania Straino, Francesca Cianfarani, Paul Johnson, Eoin O'Cearbhaill, Cairtriona Lally, Garry P Duffy. Towards a Whole Sample Imaging Approach Using Diffusion Tensor Imaging to Examine the Foreign Body Response to Explanted Medical Devices, *Polymers* 14 (22), 4819, 2022.

B Tornifoglio, AJ Stone, C Kerskens, C Lally. Ex vivo study using diffusion tensor imaging to identify biomarkers of atherosclerotic disease in human cadaveric carotid arteries. *Arteriosclerosis, Thrombosis, and Vascular Biology* 42 (11), 1398-1412, 4, 2022.

OM McGee, S Geraghty, C Hughes, P Jamshidi, DP Kenny, MM Attallah, C Lally. An investigation into patient-specific 3D printed titanium stents and the use of etching to overcome Selective Laser Melting design constraints, *Journal of the Mechanical Behavior of Biomedical Materials* 134, 105388. 19, 2022.

Dr. Caroline Curtin/Prof. Fergal O'Brien/Danny Kelly

Joyce, M., Hodgkinson, T., Lemoine, M., Gonzalez-Vazquez, A., Kelly, D.J., O'Brien, F.J. (2023) Development of a 3D-printed bioabsorbable composite scaffold with mechanical properties suitable for treating large, load-bearing articular cartilage defects. *eCells&Materials*.
Doi: 10.22203/eCM

Asaro, G.A., Solazzo, M., Suku, M., Spurling, D., Genoud, K., Gutierrez-Gonzalez, J., O'Brien, F.J., Nicolosi, V., Monaghan, M.G. (2023) MXene functionalized collagen biomaterials for cardiac tissue engineering driving iPSC-derived cardiomyocyte maturation. *Nature 2D Materials and Applications*. Doi: 10.1038/s41699-023-00409-w

Liu, Y., Puthia, M., Sheehy, E.J., Ambite, I., Petrlova, J., Prithviraj, S., Oxborg, M.W., Sebastian, S., Vater, C., Zwingenberger, S., Struglics, A., Bourguine, P.A., O'Brien, F.J., Raina, D.B. (2023) Sustained delivery of a heterodimer bone morphogenetic protein-2/7 via a collagen hydroxyapatite scaffold accelerates and improves critical femoral defect healing. *Acta Biomaterialia*.
Doi: 10.1016/j.actbio.2023.03.028

Intini, C., Ferreras, L.B., Casey, S., Dixon, J.E., Gleeson, J.P., O'Brien F.J. (2023) An Innovative miR-Activated Scaffold for the Delivery of a miR-221 Inhibitor to Enhance Cartilage Defect Repair. *Advanced Therapeutics*.
10.1002/adtp.202200329



TRINITY CENTRE FOR BIOMEDICAL ENGINEERING PAPERS (CONTINUED)

McGrath, M., Zimkowska, K., Genoud, K.J., Maughan, J., Gutierrez-Gonzalez, J., Browne, S., O'Brien F.J. (2023). A Biomimetic, Bilayered Antimicrobial Collagen-Based Scaffold for Enhanced Healing of Complex Wound Conditions. *Applied Materials and Interfaces*. 10.1021/acsami.2c18837.

O'Connor, C., Woods, I., Hibbitts, A., Dervan, A., O'Brien F.J. (2023) The Manufacture and Characterization of Biomimetic, Biomaterial-Based Scaffolds for Studying Physicochemical Interactions of Neural Cells in 3D Environments. *Current Protocols*. <https://doi.org/10.1002/cpz1.688>

Levingstone, T., Sheehy, E., Moran, C.J., Cunniffe, G.M., Payno, P.J.D., Brady, R.T., Almeida, H.V., Carroll, S.F., O'Byrne, J.M., Kelly, D.J., Brama, P.A.J., O'Brien, F.J. (2022) Evaluation of a co-culture of rapidly isolated chondrocytes and stem cells seeded on tri-layered collagen-based scaffolds in a caprine osteochondral defect model. *Biomaterials and Biosystems*. <https://doi.org/10.1016/j.bbiosy.2022.100066>

Carroll, P., Dervan, A., Maher, A., McCarthy, C., Woods, I., Kavanagh, R., Beirne, C., Harte, G., O'Flynn, D., O'Connor, C., McGuire, T., Leahy, L.M., Gonzalez, J.G., Stasiewicz, M., Maughan, J., Gouveia, P.J., Murphy, P.J., Quinlan, J., Casey, S., Holton, A., Smith É., Moriarty, F., O'Brien F.J., Flood, M. (2022) Applying Patient and Public Involvement in preclinical research: A co-created scoping review. *Health Expectations*. DOI: 10.1111/hex.13615

Maughan, J., Gouveia, P.J., Gutierrez-Gonzalez, J., Leahy, L.M., Woods, I., O'Connor, C., McGuire, T., Garcia, J.R., O'Shea, D.G., McComish, S.F., Kennedy, O.D., Caldwell, M.A., Dervan, A., Coleman, J.N., O'Brien, F.J. (2022) Collagen/pristine graphene as an electroconductive interface material for neuronal medical device applications. *Applied Materials Today*. <https://doi.org/10.1016/j.apmt.2022.101629>

Santarella, F., do Amaral, R.J.F.C., Lemoine, M., Kelly, D., Cavanagh, B., Marinkovic, M., Smith, A., Garlick, J., O'Brien, F.J., Kearney, C.J. (2022) Personalized scaffolds for diabetic foot ulcer healing using extracellular matrix from iPS-reprogrammed patient cells. *Advanced NanoBioMed Research*.

Lackington, W., Gehweiler, D., Zhao, E., Zderic, I., Nehrbass, D., Zeiter, S., Gonzalez-Vazquez, A., O'Brien, F.J., Stoddart, M.J., Thompson, K. (2022) Interleukin-1 receptor antagonist enhances the therapeutic efficacy of a low dose of rhBMP-2 in a weight-bearing rat femoral defect model. *Acta Biomaterialia*. 10.1016/j.actbio.2022.07.012



TRINITY CENTRE FOR BIOMEDICAL ENGINEERING PAPERS (CONTINUED)

Pitacco, P., Sadowska, J.M., O'Brien, F.J., Kelly, D.J. (2022) 3D bioprinting of cartilaginous templates for large bone defect healing. *Acta Biomaterialia*. 10.1016/j.actbio.2022.07.037

Dr. Ciara Murphy

K. Kaur, R. Sannoufi, J.S. Butler, C.M. Murphy. Biomimetic Inspired Hydrogels for Regenerative Vertebral Body Stenting. *Current Osteoporosis Reports*, 2023; 21(6), 806-814

K. Kaur, C.M. Murphy. Advances in the Development of Nano-Engineered Mechanically Robust Hydrogels for Minimally Invasive Treatment of Bone Defects. *Gels*. 2023; 9(10), 809

L Nair, S Mukherjee, K Kaur, C.M. Murphy, V Ravichandiran, S Roy, M Singh. Multi compartmental 3D breast cancer disease model—recapitulating tumor complexity in in-vitro. *Biochimica et Biophysica Acta - General Subjects*. 2023; 1867(6), 130361

C.R. Simpson, B.L. Cavanagh, H. M. Kelly, C.M. Murphy. Simple Technique for Microscopic Evaluation of Active Cellular Invasion into 3D Hydrogel Constructs. *ACS Biomaterials Science and Engineering*. 2023; 9(3), 1243–1250

Prof. Michael Monaghan

N Neto, M Suku, D Hoey, MG Monaghan. 2P-FLIM unveils time-dependent metabolic shifts during osteogenic differentiation with a key role of lactate to fuel osteogenesis via glutaminolysis identified *Stem Cell Research and Therapy* 14, 364

Monaghan MG, Borah R, Thomsen C, Browne S. Thou shall not heal: Overcoming the non-healing behavior of diabetic foot ulcers by engineering the inflammatory microenvironment. *Advanced Drug Delivery Reviews* (2023). 115120

Margarida Barroso, Michael G. Monaghan, Raluca Niesner, Ruslan I. Dmitriev. Probing organoid metabolism using Fluorescence Lifetime Imaging Microscopy (FLIM): the next frontier of drug discovery and disease understanding. *Advanced Drug Delivery Reviews*. In Press August 2023, <https://doi.org/10.1016/j.addr.2023.1150>

M Solazzo, MG Monaghan. A workflow to produce a low-cost in vitro platform for the electric-field pacing of cellularised 3D porous scaffolds. *ACS Biomaterials Science and Engineering*. 2023, 9, 8, 4573–4582



TRINITY CENTRE FOR BIOMEDICAL ENGINEERING PAPERS (CONTINUED)

Farhad Chariyev-Prinz, Nuno Neto, Michael G. Monaghan, Daniel J. Kelly. Time-Dependent Anabolic Response of hMSC-Derived Cartilage Grafts to Hydrostatic Pressure, *Journal of Tissue Engineering and Regenerative Medicine*, (2023) | Article ID 9976121.
<https://doi.org/10.1155/2023/99761>

Giuseppe A. Asaro, Matteo Solazzo, Meenakshi Suku, Dahnna Spurling, Katelyn Genoud, Javier Gutierrez Gonzalez, Fergal J. O' Brien, Valeria Nicolosi & Michael G. Monaghan. MXene functionalized collagen biomaterials for cardiac tissue engineering driving iPSC-derived cardiomyocyte maturation. *npj 2D Mater Appl* 7, 44 (2023).
<https://doi.org/10.1038/s41699-023-00409-w>

F. Chariyev-Prinz, A. Szojka, N. Neto, R. Burdis, M. G. Monaghan and D. J. Kelly. An assessment of the response of human MSCs to hydrostatic pressure in environments supportive of differential chondrogenesis. *Journal of Biomechanics*. 2023 Vol. 154 Pages 111590.

Conor Darroch, Giuseppe A. Asaro, Coralie Gréant, Meenakshi Suku, Nele Pien, Sandra van Vlierberghe, Michael G. Monaghan. Melt Electrowriting of a Biocompatible Photo-Crosslinkable Poly(D,L-lactic acid)/Poly(ε-Caprolactone)-Based Material with Tunable Mechanical and Functionalization Properties. *J Biomed Mater Res*. 2023; 111(6): 851-862.

LC Shanley, OR Mahon, SA O'Rourke, NGB Neto, MG Monaghan, DJ Kelly, A Dunne Macrophage metabolic profile is altered by hydroxyapatite particle size. *Acta Biomaterialia* 160, 311-321

MF Rooney, NGB Neto, MG Monaghan, EW Hill, RK Porter Conditionally immortalised equine skeletal muscle cell lines for in vitro analysis. *Biochemistry and Biophysics Reports* 33, 101391

Dr. Alejandro López-Valdés

Sara Solis-López, Aníbal Gutiérrez-Torres, Alejandro López-Valdés, José Alberto Ávila-Funes, Carmen García-Peña, Brian Lawlor, Roman Romero-Ortuno (2023). Age-friendly initiatives: Mexico. *Journal of Nutrition, Health and Aging*. Doi : 10.1016/j.jnha.2023.100007

Manjarrez E, Curia G, Stecina K and Lopez Valdes A (2023) Editorial: Bridging the gap between integrative neuroscience and translational neuroscience. *Front. Integr. Neurosci.* 17:1296701. doi: 10.3389/fnint.2023.1296701

Calderon De Palma, I., Lopez, L.S., Lopez Valdes, A. (2023) Effects of spectral and temporal modulation degradation on intelligibility and cortical tracking of speech signals. *Proc. INTERSPEECH 2023*, 5192-5196, doi: 10.21437/Interspeech.2023-964



TRINITY CENTRE FOR BIOMEDICAL ENGINEERING PAPERS (CONTINUED)

S. Farrell and A. L. Valdes, "The Mind' promotes brain synchronization: an ecological evaluation of brain synchronization in co-operative tasks," 2023 45th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), Sydney, Australia, 2023, pp. 1-4, doi: 10.1109/EMBC40787.2023.10340212.

Carta S, Mangiacotti AMA, Valdes AL, Reilly RB, Franco F, Di Liberto GM. The impact of temporal synchronisation imprecision on TRF analyses. *J Neurosci Methods*. 2023 Feb 1;385:109765. doi: 10.1016/j.jneumeth.2022.109765. Epub 2022 Dec 5. PMID: 36481165.

Prof. C. Buckley

McDonnell E.E., Barcellona M.N., Wilson N., Ní Néill T., Brama P.A.J., Cunniffe G., Darwish S., Butler J.S. and **Buckley C.T.** Preclinical to Clinical Translation for Intervertebral Disc Repair: Effects of Species-Specific Scale, Metabolism and Matrix Synthesis Rates on Cell-Based Regeneration. *JOR Spine* 6(3): e1279, 2023

Basatvat S., Bach F., Barcellona M.N., Binch A.L., **Buckley C.T.**, Bueno B., Chahine N., Chee A., Creemers L., Dudli S., Fearing B., Ferguson S., Gansau J., Gantenbein B., Gawri R., Glaeser J., Grad S., Guerrero J., Haglund L., Hernandez P., Hoyland J., Huang C., Iatridis J.C., Illien-Junger S., Ito K., Jing L., Kaito T., Kraus P., Kushioka J., Laagland L., Lang G., Leung V., Li Z., Lufkin T., McDonnell E., O'Connell G., Panebianco C.J., Presciutti S., Rao S., Richardson S., Romereim S., Salzer E., Schmitz T., Schol J., Setton L., Sheyn D., Snuggs J., Sun Y., Tan X., Tryfonidou M., Van Maanen J., Vo N., Wang D., Williams B., Williams R., Yoon ST. and Le Maitre CL. Harmonization and standardization of nucleus pulposus cell culture methods. *JOR Spine* 6(1):e1238, 2023

McDonnell E.E. and **Buckley C.T.** Two- and three-dimensional in vitro nucleus pulposus cultures: An in silico analysis of local nutrient microenvironments. *JOR Spine*, 5(3): e1222, 2022

Barcellona M., Samuel S., McDonnell E and **Buckley C.T.** Rat tail models for assessment of injectable nucleus pulposus regeneration strategies. *JOR Spine*, 5(3): e1216, 2022

Browe D.C., Burdis R., Diaz Payno P., Freeman F.E., Nulty J.M., **Buckley C.T.**, Brama P.A.J. and Kelly, D.J. Promoting endogenous articular cartilage regeneration using extracellular matrix scaffolds. *Materials Bio Today*, 16:100343, 2022

Browe D.C., Díaz-Payno P.J., Freeman F.E., Schipani, R., Burdis R., Ahern D.P, Nulty J.M., Guler S., Randall L.D., **Buckley C.T.**, Brama P.A.J. and Kelly, D.J. Bilayered extracellular matrix derived scaffolds with anisotropic pore architecture guide tissue organization during osteochondral defect repair *Acta Biomaterialia*, 143:266-281, 2022



TRINITY CENTRE FOR BIOMEDICAL ENGINEERING PAPERS (CONTINUED)

Samuel S., McDonnell E.E. and **Buckley C.T.** Effects of growth factor combinations on the matrix synthesis of nucleus pulposus and nasoseptal chondrocyte self-assembled microtissues. *Applied Sciences. Appl. Sci.* 12(3), 1453, 2022

McDonnell E.E. and **Buckley C.T.** Consolidating and re-evaluating the human disc nutrient microenvironment. *JOR Spine*, 5(1):e1192, 2022

Hibbitts A.J., Koci Z., Kneafsey S., Zilic L., Dervan A., Hinton P., Chen G., Cavanagh B., **Buckley C.T.**, Archibald S.J. and O'Brien F.J. Multi-factorial nerve guidance conduit engineering improves outcomes in inflammation, angiogenesis and large defect nerve repair. *Matrix Biology*, 106, 34-57, 2022

Prof. D. Hoey

Shen, N., Maggio, M., Woods, I., Lowry, M., Almasri, R., Corgun, C., Eichholz, K., Stavenschi, E., Hokamp, K., Roche, F.M., O'Driscoll, L., **Hoey D.A.**, *Mechanically activated mesenchymal-derived bone cells drive vessel formation via an extracellular vesicle mediated mechanism.* *Journal of Tissue Engineering*. 14:20417314231186918, 2023

Murphy, B., Martins, C., Maggio, M., Morris, M.A., **Hoey D.A.**, *Nano sized gallium oxide surface features for enhanced antimicrobial and osteo-integrative responses.* *Colloids and Surfaces B: Biointerfaces*. 227, 113378, 2023

Whelan, I., Moeendarbary, E., **Hoey D.A.**, Kelly, D.J., *A Microphysiological Model of Bone Development and Regeneration.* *Biofabrication*. 5(3), 2023

Sarmast Sh, M., Leow, Y.S., Dayang Radiah, A.B., Abdullah, N., Alijantabar Aghouzi, S., **Hoey, D.A.**, Kamarudin, S., Zainuddin, H.S., *Evaluation of bioactivity and antibacterial properties of bioglass fabricated using a cellulose nano fibre template.* *Materials Chemistry and Physics*, 127863. 2023.

Man, K., Eisenstein, E., **Hoey, D.A.**, Cox, S.C., *Bioengineering extracellular vesicles: smart nanomaterials for bone regeneration.* *Journal of Nanobiotechnology*. 21:137, 2023.

Khatib, N.S., Monsen, J., Ahmed, S., Huang, Y., **Hoey D.A.**, Nowlan, N.C., *Mechanoregulatory role of TRPV4 in prenatal limb development.* *Science Advances*. 9(4). 2023



TRINITY CENTRE FOR BIOMEDICAL ENGINEERING PAPERS (CONTINUED)

Krueger, E.T., Buscher, J.V., **Hoey D.A.**, Taylor, D., O'Reilly, P.O., Crowley, Q.C., *Wanted Dead or Alive: Skeletal Structure Alteration of Cold-Water Coral *Desmophyllum pertusum* (*Lophelia pertusa*) from Anthropogenic Stressors.* Oceans. 4(1), p68-79. 2023

Villapun Puzas, V.M., Carter, L.N., Schröder, C., Colavita, P.E., **Hoey, D.A.**, Webber, M.A., Addison, O., Shepherd, D.E.T., Attallah, M.M., Grover, L.M., Cox, S.C., *Surface Free Energy Dominates the Biological Interactions of Postprocessed Additively Manufactured Ti-6Al-4V.* ACS Biomaterials Science and Engineering. 8(10): 4311–4326, 2022.

Eichholz, K., Freeman, F., Pitacco, P., Nulty, J., Ahern, D., Burdis, R., Browe, D., Garcia, O., **Hoey D.A.**, Kelly, D.J., *Scaffold microarchitecture regulates angiogenesis and the regeneration of large bone defects* Biofabrication. 14(4), 045013. 2022

Eichholz, K., Gonçalves, I., Barceló, X., Federici, A.S., **Hoey D.A.**, Kelly, D.J., *How to design, develop and build a fully-integrated melt electrowriting 3D printer* Additive Manufacturing. 58, 102998. 2022

Sarmast Sh, M., George, S., Dayang Radiah, A.B., **Hoey, D.A.**, Abdullah N., Kamarudin, S., *Synthesis of bioactive glass using cellulose nano fibre template.* Journal of the Mechanical Behavior of Biomedical Materials, 130. 2022.

Man, K., Brunet, M., Federici, A.S., **Hoey, D.A.**, Cox, S.C., *An ECM-Mimetic Hydrogel to Promote the Therapeutic Efficacy of Osteoblast-Derived Extracellular Vesicles for Bone Regeneration.* Frontiers in Bioengineering and Biotechnology. 2022.

Brady, R.T., O'Brien, F.J., **Hoey, D.A.**, *The Impact of the Extracellular Matrix Environment on Sost Expression by the MLO-Y4 Osteocyte Cell Line.* Bioengineering, 9 (1). 35. 2022.

Man, K., Barroso, I.A., Brunet, M., Peacock, B., Federici, A.S., **Hoey, D.A.**, Cox, S.C., *Controlled Release of Epigenetically-Enhanced Extracellular Vesicles from a GelMA/Nanoclay Composite Hydrogel to Promote Bone Repair.* International Journal of Molecular Sciences. In press. 2022

Luo, L., Foster, N.C., Man, K., Brunet, M., **Hoey, D.A.**, Cox, S.C., Kimber, S.J., El Haj, A.J., *Hydrostatic pressure promotes chondrogenic differentiation and microvesicle release from human embryonic and bone marrow stem cells.* Biotechnology Journal. In press. 2022

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