

DR. MEGAN E. COOKE, PHD

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RESEARCH EXPERIENCE

Postdoctoral Fellow

McGill University

Feb. 2019 – Present

Montreal, QC

- Canadian Institutes of Health (CIHR) Postdoctoral Fellowship
Bioprinting *in vitro* models of the bone-tumour interface
- Osteology Foundation Young Researchers Grant (PI)
Microgels as support matrices for vascularisation

Visiting Researcher

McGill University

Aug. – Sep. 2018

Montreal, QC

- Barallet and Rosenzweig labs
- Trained users in bioprinting and bioink formulation
- Established protocols for myoblast isolation from rat tissue

Undergraduate Summer Intern

University of Birmingham/England Squash

June – Aug. 2013

Birmingham, UK

- Viscoelastic testing of sports equipment

EDUCATION

Doctor of Philosophy | *Chemical Engineering*

Thesis: Mechanics and *in vitro* modelling of the osteochondral unit

Oct. 2015 – Oct. 2018

University of Birmingham, UK

- Physical Sciences for Health Doctoral Training Centre
- Four first/co-first author publications
- Keynote lecture at International Conference

Master of Science | *Chemistry*

Thesis: Hydrodynamic lithography for collagen alignment

Sep. 2014 – Sep. 2015

University of Birmingham, UK

- Physical Sciences for Health Doctoral Training Centre
- Distinction (Equ. 4.0 GPA)
- Highest grade in cohort

Bachelor of Science (Hons.) | *Materials Science (Major), Sports Science (Minor)*

Thesis: Chitosan hydrogels for ocular antimicrobial delivery

Sep. 2011 – June 2014

University of Birmingham, UK

- First Class Honours (Equ. 4.0 GPA)
- Award for best polymers dissertation

GRANTS | *Total: 106,000 CAD / 84,000 USD*

Osteology Foundation, PI – 25,900 CHF

2021-2022

“A semi-structured fluid gel for enhanced vascularisation in bone defect repair”

UNIFYPlus (EPSRC), Co-I – 41,000 GBP

2017-2018

“Near-Infrared Spectroscopy (NIRS) for the detection and identification of atypical oxygenation at the fracture site”

Canadian Biomaterials Society Postdoctoral Experience Award – 3,000 CAD	2021
Collaborative exchange visit, University of Victoria	
Orthopaedic Research Society (ORS)	2021
Trainee Award	
Canadian Institutes of Health Research (CIHR) Postdoctoral Fellowship – 67,500 CAD	2020-2022
Bioprinted in vitro models of the healthy-cancerous bone environment	
Fonds de Recherche Quebec-Nature et Technologies Fellowship – 90,000 CAD	2020-2022
Optimising osteoinduction and osteoconduction of bioprinted bone scaffolds	
Fonds de Recherche Quebec Merit Fellowship – 35,000 CAD	2020-2021
Merit Fellowship for International Postdoctoral Researchers	
Canadian Biomaterials Society	2020
Travel award to attend World Biomaterials Congress 2020	
RI-MUHC Postdoctoral Fellowship – 18,000 CAD	2020
“Development of a bioprinted in vitro model of the healthy bone-giant cell tumour microenvironment”	
RBSO Postdoctoral Scholarship – 10,000 CAD	2019-2020
Bioprinting in vitro bone cancer models	
RBSO Postdoctoral Scholarship – 10,000 CAD	2018-2019
Bioprinting in vitro bone cancer models	
PrimerDesign Silver Scholarship	2017-2019
Funding for qRT-PCR reagents and advice	
ECI Biofabrication of hierarchical in vitro models	2016
Travel Award	
Highest Mark in Cohort, Physical Sciences for Health	2015
Recognition for highest academic achievement in Masters program	
EPSRC studentship – 56,000 GBP	2014-2018
Physical Sciences for Health Doctoral Training Centre	
Bob Mills award	2014
Recognition of highest mark in undergraduate dissertation	
Undergraduate Academic Scholarship	2011-2014
Recognition of academic performance prior and during undergraduate studies	

TEACHING AND CO-SUPERVISION

Guest Lecturer	2021
Tissue Engineering, BIEN330	
	McGill University, QC
Teaching Assistant	2020
Knowledge Management, EXSU601	
	McGill University, QC
MSc Mentor - Audrey Pitaru, Cynthia Ventrella, Ateeque Siddique	2020-2021
Chemotherapeutic delivery strategies to critical bone defects	
	McGill University, QC
PhD Mentor - Hyeree Park	2019-2021
Dense Collagen Scaffolds for Tissue Engineering	
	McGill University, QC
MSc Mentor - Jean-Gabriel Lacombe, Samantha Ozere	2019-2021
Ligament and Cartilage Tissue Engineering strategies (P)	
	McGill University, QC
MRes Mentor - Miruna Chipara	2018
CLARITY Imaging of human bone samples	
	University of Birmingham, UK

MSc Co-Supervisor - Sophie Mountcastle, Ben Mellors	2017-2018
Dynamic mechanical analysis of osteochondral tissues (P)	University of Birmingham, UK
MEng Co-Supervisor - Ruaridh Wood	2017-2018
Frequency dependence and fatigue properties of polysaccharide hydrogels	University of Birmingham, UK
MEng Co-Supervisor - Samsam Ali, Oyinkansola Adegbola	2017-2018
Identification of novel compounds in human bone samples	University of Birmingham, UK
International Co-Supervisor - T Majumdar (PhD), F Bellier (MSc)	2017
Dynamic mechanics of hydrogels (P)	University of Birmingham, UK
Guest Lecturer	2015 - 2017
Frontiers in Biomedicine, graduate level	University of Birmingham, UK

PEER-REVIEWED JOURNAL ARTICLES | *Joint first-author †Corresponding author

20. S. Naseri*, **M.E. Cooke***, D.H. Rosenzweig, M. Tabrizian[†], 3D printed in vitro dentin model to investigate occlusive agents against tooth sensitivity. *Materials* 14(23), 7255 (2021) doi:10.3390/ma14237255
19. S. Ozere, S. Chergui, **M. E. Cooke**, T. Pauyo, D. H. Rosenzweig[†], The Link between Aggrecan and Familial Osteochondritis Dissecans. *Surgeries*. 2, 128138 (2021). doi:10.3390/surgeries2020012.
18. **M.E. Cooke[†]**, D.H. Rosenzweig, The rheology of direct and suspended extrusion bioprinting, *APL Bioeng.* 5 (2021). doi:10.1063/5.0031475. **Invited (Cooke) and Featured Article**
17. **M.E. Cooke***, J.L. Ramirez-GarciaLuna*, K. Rangel-Berridi, H. Park, S.N. Nazhat, M.H. Weber, J.E. Henderson, D.H. Rosenzweig[†], 3D printed polyurethane scaffolds for the repair of bone defects, *Front. Bioeng. Biotechnol.* 8 (2020) 1190. doi:10.3389/FBIOE.2020.557215.
16. A. Pitaru, J.-G. Lacombe, **M.E. Cooke**, L. Beckman, T. Steffen, M.H. Weber, P.A. Martineau, D.H. Rosenzweig[†], Investigating Commercial Filaments for 3D Printing of Stiff and Elastic Constructs with Ligament-Like Mechanics, *Micromachines*. 11 (2020) 846. doi:10.3390/mi11090846.
15. J.J. Senior*, **M.E. Cooke***, L.M. Grover, A.M. Smith[†], Fabrication of Complex Hydrogel Structures Using Suspended Layer Additive Manufacturing (SLAM), *Adv. Funct. Mater.* 1904845 (2019) 1904845. doi:10.1002/adfm.201904845.
14. S.E. Mountcastle, P. Allen, B.O.L. Mellors, B.M. Lawless, **M.E. Cooke**, C.E. Lavecchia, N.L.A. Fell, D.M. Espino, S.W. Jones, S.C. Cox[†], Dynamic viscoelastic characterisation of human osteochondral tissue: Understanding the effect of the cartilage-bone interface, *BMC Musculoskelet. Disord.* 20 (2019). doi:10.1186/s12891-019-2959-4.
13. N. Pearman, S.R. Moxon, S.M. Carnachan, **M.E. Cooke**, E.I. Nep, I.M. Sims, G.A. Morris, A.M. Smith[†], Investigating potential wound healing properties of polysaccharides extracted from *Grewia mollis* Juss. and *Hoheria populnea* A. Cunn. (Malvaceae), *Bioact. Carbohydrates Diet. Fibre.* (2019) 100201. doi:10.1016/j.bcdf.2019.100201.
12. G. Cidonio, **M. Cooke**, M. Glinka, J.I. Dawson, L. Grover, R.O.C. Oreffo[†], Printing bone in a gel: using nanocomposite bioink to print functionalised bone scaffolds, *Mater. Today Bio.* (2019) 100028. doi:10.1016/j.mtbio.2019.100028.
11. O.G. Davies, S.C. Cox, I. Azoidis, A.J. McGuinness, **M.E. Cooke**, L.M. Heaney, L.M. Grover[†], Osteoblast-derived vesicle protein content is temporally regulated during osteogenesis: implications for regenerative therapies, *Front. Bioeng. Biotechnol.* 7 (2019) 92. doi:10.3389/FBIOE.2019.00092.
10. P. Ahangar, **M.E. Cooke**, M.H. Weber, D.H. Rosenzweig[†], Current Biomedical Applications of 3D Printing and Additive Manufacturing, *Appl. Sci.* 9 (2019) 1713. doi:10.3390/app9081713.

9. M.J. Pearson, A.M. Philp, H. Haq, **M.E. Cooke**, T. Nicholson, L.M. Grover, M. Newton Ede, S.W. Jones[†], Evidence of Intrinsic Impairment of Osteoblast Phenotype at the Curve Apex in Girls With Adolescent Idiopathic Scoliosis, *Spine Deform.* 7 (2019) 533542. doi:10.1016/j.jspd.2018.11.016.
8. N.L.A. Fell, B.M. Lawless, S.C. Cox, **M.E. Cooke**, N.M. Eisenstein, D.E.T. Shepherd, D.M. Espino[†], The role of subchondral bone, and its histomorphology, on the dynamic viscoelasticity of cartilage, bone and osteochondral cores, *Osteoarthr. Cartil.* 27 (2019) 535543. doi:10.1016/j.joca.2018.12.006.
7. **M.E. Cooke**[†], B.M. Lawless, S.W. Jones, L.M. Grover, Matrix degradation in osteoarthritis primes the superficial region of cartilage for mechanical damage, *Acta Biomater.* (2018). doi:10.1016/j.actbio.2018.07.037.
6. **M.E. Cooke**, S.W. Jones, B. ter Horst, N. Moiemmen, M. Snow, G. Chouhan, L.J. Hill, M. Esmaeli, R.J.A. Moakes, J. Holton, R. Nandra, R.L. Williams, A.M. Smith, L.M. Grover[†], Structuring of Hydrogels across Multiple Length Scales for Biomedical Applications, *Adv. Mater.* 30 (2018). doi:10.1002/adma.201705013.
5. T. Majumdar, **M.E. Cooke**, B.M. Lawless, F. Bellier, E.A.B. Hughes, L.M. Grover, S.W. Jones, S.C. Cox[†], Formulation and viscoelasticity of mineralised hydrogels for use in bone-cartilage interfacial reconstruction, *J. Mech. Behav. Biomed. Mater.* 80 (2018) 3341. doi:10.1016/j.jmbbm.2018.01.016.
4. E.A.B. Hughes, S.C. Cox, **M.E. Cooke**, O.G. Davies, R.L. Williams, T.J. Hall, L.M. Grover[†], Interfacial Mineral Fusion and Tubule Entanglement as a Means to Harden a Bone Augmentation Material, *Adv. Healthc. Mater.* 7 (2018). doi:10.1002/adhm.201701166.
3. **M.E. Cooke**[†], M.J. Pearson, R.J.A. Moakes, C.J. Weston, E.T. Davis, S.W. Jones, L.M. Grover, Geometric confinement is required for recovery and maintenance of chondrocyte phenotype in alginate, *Cit. APL Bioeng.* 1 (2017). doi:10.1063/1.5006752.
2. S.R. Moxon*, **M.E. Cooke***, S.C. Cox, M. Snow, L. Jeys, S.W. Jones, A.M. Smith, L.M. Grover[†], Suspended Manufacture of Biological Structures, *Adv. Mater.* 29 (2017) 16. doi:10.1002/adma.201605594.
1. S. Mohammed, G. Chouhan, O. Anuforum, **M.E. Cooke**, A. Walsh, P. Morgan-Warren, M. Jenkins, F. De Cogan[†], Thermosensitive hydrogel as an in situ gelling antimicrobial ocular dressing, *Mater. Sci. Eng. C.* (2017) 203209. doi:10.1016/j.msec.2017.04.065.

Submitted M. Mohesini, **M.E. Cooke**, M.R. Wertheimer, D.H. Rosenzweig, A Aji, A novel 3D in vitro tissue model for bone-metastasized breast cancer: a pre-clinical tool in drug discovery and testing

In Prep M.E. Cooke, D.H. Rosenzweig, Bioprinted *in vitro* models of metastatic tumor migration to bone (Data available upon reasonable request)

In Prep M.E. Cooke, L.M. Grover, Techniques for the physicochemical analysis of articular cartilage (Manuscript available)

In Prep M.E. Cooke, S.W. Jones, L.M. Grover, Structural changes to the human tibial plateau in osteoarthritis (Data available upon reasonable request)

INVITED TALKS

Regenerative Medicine Axis Seminar, Université Laval	November 2021
3D bioprinting for musculoskeletal tissue engineering and disease modelling	Quebec City, QC, Canada
European Society for Artificial Organs	September 2021
Bioprinting in vitro models of the bone-tumour interface	London, UK (Virtual)
International Conference of Biofabrication	October 2018
Structuring hydrogels to enable suspended manufacture (SLAM) of low viscosity bioinks	Wurzburg, Germany

Faculty of Chemical Engineering, University of Illinois

Mechanics and *in vitro* modelling of the osteochondral unit

UK Government Department for Education

Women in STEM in higher education

September 2018

Urbana-Champaign, IL

April 2018

Westminster, UK

CONFERENCE AND SEMINAR PRESENTATIONS

McGill Regenerative Medicine Network - MRM Talks

Bioprinting to model the bone-tumour microenvironment *in vitro*

May 2021

McGill University (Virtual)

Virtual Seminars in Biomedical Science

Biofabrication of an *in vitro* human bone metastasis model

April 2021

Imperial College London (Virtual)

World Biomaterials Congress

Bioprinted *in vitro* models of the bone-tumor interface

December 2020

Glasgow (Virtual)

Termis-EU workshop on bioprinting for Cancer Research

An *in vitro* model of bone metastases

August 2019

Nantes, France

International Conference of Biofabrication

Keynote: Structuring hydrogels to enable suspended manufacture (SLAM) of low viscosity bioinks

October 2018

Wurzburg, Germany

UK Society of Biomaterials

Influence of hydrogel structuring on cell phenotype

June 2018

Bath, UK

9th International workshop on interfaces: New Frontiers

Modelling the osteochondral interface using ALM of soft solids

June 2018

Santiago de Compostela, Spain

Meeting of the German Society for Biomaterials

Geometric confinement is required for recovery of chondrocyte phenotype

November 2017

Wurzburg, Germany

Biofabrication of hierarchical *in vitro* tissue models

Suspended manufacture of biological structures

June 2017

Vienna, Austria

TransMED

Suspended manufacture of biological structures

June 2017

Birmingham, UK

POSTER PRESENTATIONS

Biomedical Engineering Society (BMES)

Bioprinted *in vitro* models of the bone-tumour interface

October 2020

San Diego, USA (Virtual)

Termis-EU workshop on bioprinting for Cancer Research

Additive manufacture for *in vitro* modelling of human giant cell tumour of bone

August 2019

Nantes, France

World Congress of Biomechanics

Altered viscoelastic response in OA cartilage is attributed to an altered proteoglycan distribution

July 2018

Dublin, Ireland

OARSI

Loss of proteoglycan content primes articular cartilage for mechanically induced damage

April 2018

Liverpool, UK

ATREUM

Suspended manufacture of biological structures

April 2017

Crewe, UK

World Biomaterials Congress

Production of a hydrogel-based *ex vivo* model for osteochondral repair

May 2016

Montreal, Canada

OARSI

Biochemical and biophysical properties of a biomimetic cartilage model

April 2016

Amsterdam, Netherlands

SERVICE AND VOLUNTARY ROLES

Journal peer reviewer

ABME, Acta Biomaterialia, ACS Omega, Advanced Healthcare Materials, Bioengineering & Translational Medicine, Biomedical Microdevices, BMC Musculoskeletal Disorders, International Journal of Molecular Sciences, Journal of the Royal Society Interfaces, Journal of Healthcare Engineering, Materials, Metals, Micromachines, Scientific Reports

Biomedical Engineering Society Annual Meeting (US) 2021
Abstract Reviewer

CIHR Doctoral Awards 2020-2021
Review Panel for PhD awards

Canadian Biomaterials Society Annual Meeting 2021
Symposium Chair, Abstract Reviewer, Presentation Judge

Review Editor - Biomaterials 2021
Frontiers in Materials, Frontiers in Bioengineering and Biotechnology

Special Topic Editor - Frontiers in Bioengineering and Biotechnology 2021
Biofabrication and Biopolymeric Materials Innovation for Musculoskeletal Tissue Regeneration

McGill Institute for Advanced Materials 2020-2021
Trainee Committee Lead

Win4Science (Women in Life Science) 2020-2021
Mentor to female graduate students

Canadian Connective Tissue Conference 2019
Abstract reviewer, Poster Judge

RSBO executive board 2019-2020
Trainee Representative

Conference Organiser, TRANSmed 2017
Conference for students in EPSRC doctoral training centres

STEM Ambassador 2014-2018
Delivering scientific outreach activities at museums and community fairs

PROFESSIONAL MEMBERSHIPS

The American Society for Bone and Mineral Research 2021-2022
Full Member

US Bone and Joint Initiative (USBJI) 2020-2023
Young Investigators Initiative - grant writing mentorship provided by NIH/CIHR panel members

Biomedical Engineering Society (BMES) 2020-2022
Early Career Member

Orthopaedic Research Society (ORS) 2020-2022
Trainee Member

American Chemical Society (ACS) 2020-2022
Regular Member

Canadian Biomaterials Society (CBS) 2020-2022
Trainee Member

Institute of Mining, Minerals and Materials (IOM3) 2011-2021
Graduate Member

FURTHER QUALIFICATIONS AND PROFESSIONAL DEVELOPMENT COURSES

Leading with Psychological Safety Organizational Development training	2021 McGill University, QC
Working in diverse teams Organizational Development training	2021 McGill University, QC
Sustainable Purchasing Organizational Development training	2021 McGill University, QC
Leading in the time of COVID-19 and beyond Organizational Development training	2021 McGill University, QC
Course Design Workshop T-PULSE	2020 McGill University, QC
Winter School - Research methods in Winter Sports Equipment International Sports Engineering Association	2013 Cortina, Italy
Canadian Ski Instructors Alliance (CSIA) Level 2 Ski Instructor, Entry Level Race Coach	2011 Sunshine Village, AB
Avalanche Canada Avalanche Skills Training - Level 1	2011 Sunshine Village, AB