International Conference on Biofabrication

BIOFABRICATION 2021 AUSTRALIA

27–29 September 2021

PROGRAM

MONDAY 27 SEPTEMBER 2021

0830–0900 AEST (UTC+10)	**OPENING CEREMONY** *Conference Chair:* **Prof Gordon Wallace**, *University of Wollongong* **Prof James Yoo**, *ISBF President* **Prof Patricia Davidson**, *University of Wollongong Vice Chancellor* **Prof Hugh Durrant-Whyte**, *Chief Scientist NSW Government* **Lord Mayor Gordon Bradbury**, *City of Wollongong* - Welcome to the Gong, virtually
0900–0940	*With thanks to our Major Sponsor* – A word from Inventia Life Science's Dr Martin Engel From microtissues to regenerative medicine using drop-on-demand bioprinting technology Plenary I: **Prof Peter Choong**, *St Vincent's Hospital, Australia* The translational challenges for clinicians
	BREAK

0945–1120	CONCURRENT SESSION 1	CONCURRENT SESSION 2	CONCURRENT SESSION 3
Theme	Biomaterials/Bioinks/ Biopolymers	Biofabricated Tissues and Organs	Fabrication Methods and Technologies
Session Sponsor	CollPlant	IOP Publishing	IOP Publishing
Session Chair	*Gabriella Lindberg*	*Khoon Lim & Jinah Jang*	*Carmine Gentile & Elena Juan Pardo*
	KEYNOTE	KEYNOTE	KEYNOTE
	Dr Zhilian Yue, *University of Wollongong* Hybrid Printing Chondral Constructs	**Dr Riccardo Levato**, *University Medical Center Utrecht* Bioprinting of human ductular organoids for advanced in vitro models of hepatic functionality	**Associate Prof Payal Mukherjee**, *University of Sydney* The role of 3D printing in Middle Ear Ossicular Reconstuction
	Dr Sara Romanazzo, *University of New South Wales* Omnidirectional ceramic printing in cell-matrix composites	**Ms Monica Ortiz-Hernandez**, *Veterans Affairs Puget Sound Health Care System, University of Washington* A bespoke, pre-vascularized, living bone graft for craniofacial reconstruction	**Mr Daniel Whyte**, *Deakin University* A 3D Organic Powder Printer
	Assistant Prof Miguel Castilho, *UMC Utrecht* Hydrogel-based bioinks for cell electrowriting of well-organized living structures with micrometer-scale resolution	**Mr Tilman Ahlfeld**, *Technische Universität Dresden* Biofabrication of bone grafts for alveolar cleft palates	**Dr Naomi Paxton**, *Queensland University of Technology* Plasma treatment improves vascularization in additive manufactured porous high-density polyethylene surgical implants for craniofacial and skeletal reconstruction
	Miss Gretel Major, *University of Otago* Modelling the Breast Cancer Microenvironment in vitro Using DLP Photopatterning	**Ms Edna Johana Bolivar Monsalve**, *Tecnologico De Monterrey* Continuous chaotic bioprinting of pre-vascularized tissue constructs	**Dr Mylène de Ruijter**, *UMC Utrecht* Translating Melt Electrowriting from non-planar shapes to anatomically relevant shapes for diarthrodial joint resurfacing

FOUNDATION SPONSOR | UNIVERSITY OF WOLLONGONG AUSTRALIA

CONFERENCE SUPPORTER | NSW GOVERNMENT

LAST NAME	FIRST NAME	ORGANISATION	PAPER TITLE
Chiesa	Irene	*University of Pisa*	Biofabrication and characterization of a triphasic vasculo-osseous-chondral construct to model the osteochondral complex in vitro
Chiesa	Irene	*University of Pisa*	4D printing carbon nanotube embedded silk-based bioarchitectures for intestinal surgery applications
Chung	Johnson	*University of Wollongong*	A Bioprinting approach to regenerate cartilage for microtia
Ciancolosi	Alessandro	*Department of functional materials for medicine and dentistry (FMZ)- University of Würzburg*	Optical fibre-based approach to create microfluidics platforms: simple, straightforward, and innovative solution for the generation of jammed microgel-based bioinks
Collins	James	*RMIT*	Stem cells for personalised tissue engineering
Colombo	Maria Vittoria	*Regenerative Medicine Technologies Lab, Ente Ospedaliero Cantonale (EOC)*	Human Vascularized Immuno Bone Minitissue as Antimetastatic Drug Screening Platform
Constante	Gissela	*Biofabrikation*	4D biofabrication of composite hydrogel-fiber bilayers made by 3D printing and melt-electrowriting
Czekanski	Aleksander	*York University*	Mechanical analysis of a cellulose nanofibril composite hydrogel bioink for bioprinting applications
Dai	Yichen	*National University of Singapore*	Multicomponent Polysaccharide-Fibrinogen based Bioink for 3D bioprinting of biomimetic gingival tissues
Dani	Sophie	*Technical University Dresden*	Photosynthetically active microalgae: an alternative concept for post-implantation oxygen supply of mammalian cells in bioprinted co-cultures
de Ruijter	Mylène	*UMC Utrecht*	Long-term survival of osteochondral implants in the equine model
Decoene	Isaak	*Ku Leuven*	Robotics-driven spheroid production and manufacturing of skeletal implants
Degryse	Olivier	*Ku Leuven*	Development of biocompatible acrylate-endcapped urethane-based PEG (AUP) stereolithographic resins for tissue engineering applications
Degryse	Olivier	*Ku Leuven*	Collagen composite inks for Aerosol Jet® printing in bone tissue engineering applications
Dinoro	Jeremy	*University of Wollongong*	Novel fabrication of High-Density Polyethylene via Selective Laser Sintering
Doyle	Stephanie E	*Rmit University and St Vincent's Hospital Melbourne/ACMD*	Intricate Biomaterial Structures Fabricated via Negative Embodied Sacrificial Template 3D (NEST3D) Printing
Duchi	Serena	*University of Melbourne, Vic, Australia*	In situ heterostructure delivery of photocrosslinkable hydrogel warrants neocartilage generation and implant stability
Dusseldorp	Joseph R	*Chris O'Brien Lifehouse*	The Seven Steps of Computer-Assisted Reconstructive Ear Surgery: Aiding Intra-Operative Decision Making and Standardising Outcomes
Firipis	Kate	*RMIT*	Tuneable Hybrid Hydrogels via Complementary Self-Assembly of a Bioactive Peptide with a Robust Polysaccharide
Fisch	Philipp	*ETH*	Replicating elastic cartilage in bioprinted auricles
Fitzpatrick	Xavier	*Centre for Nanoscale BioPhotonics*	3D printing computer-generated reconstructions of complex cell geometries using image-processing software: an educational tool with morphometric analysis potential
Frias-Sánchez	Ada	*Tecnologico de Monterrey*	Biofabrication of muscle fibers using surface chaotic flows and enhancement of cell attachment and proliferation with plant viral nanoparticles: A strategy to produced culture meat
Gantumur	Narangerel	*Intelligent polymer research institute*	Optimizing the bioinks for islet printing by using a customized coaxial bioprinter
Größbacher	Gabriel	*Utrecht Medical Center*	Melt Electrowriting of Polycarbonate-Urethane Elastomer for Enhanced Mechanical Properties of Meniscus Scaffolds
Guller	Anna	*UNSW*	ECM and micrometastases: the lessons from 3D engineered tumour models
Gullo	Maurizio	*FHNW - HLS*	Towards 3D bioprinted heart tissue models based on bio inks with dynamic structural properties
Guzzi	Elia	*ETH Zürich*	Hierarchical biomaterials via photopatterning-enhanced direct ink writing
Han	Jonghyeuk	*Ulsan National Institute of Science And Technology*	A 3D engineered breast tumor model with morphological heterogeneity for personalized medicine
Han	Hohyeon	*Pohang University of Science and Technology (POSTECH)*	A 3D Bioprinted Free-Standing and Self-Organized Intestine Model using a Colon-Specific Bioink
Harris	Alex	*University of Melbourne*	A framework for assessing the emergence of novel behaviours in complex systems - demonstrated in neural tissue
Hazur	Jonas	*University Erlangen-nürnberg*	Investigation of different alginate-based bioinks in terms of printability as well as cell morphology and its correlation to matrix stiffness

A 3D Bioprinted Free-Standing and Self-Organized Intestine Model using a Colon-Specific Bioink

Ms Hohyeon Han[1], Ms Yejin Park[2], Mr Uijung Yong[2], Mrs Jinah Jang[1,2,3]

[1]School of Interdisciplinary Bioscience and Bioengineering, Pohang University of Science and Technology (POSTECH), Pohang-si,, South Korea, [2]Department of Convergence IT Engineering (CiTE), Pohang University of Science and Technology (POSTECH), Pohang-si,, South Korea, [3]Department of Mechanical Engineering (ME), Pohang University of Science and Technology (POSTECH), Pohang-si,, South Korea

Biography:

Ms. Hohyeon Han is as MS and Ph.D. is a MS and Ph.D. course student in the School of Interdisciplinary Bioscience and Bioengineering at Pohang University of Science and Technology (POSTECH) in the Republic of Korea. She received her Bachelor's degree in Biomedical Engineering from Yonsei University, the Republic of Korea in 2018. She starts her research after joined Prof. Jinah Jang's group in 2019. Her research is focused on 3D bioprinting of intestine and blood-brain barrier models.

Intestine-related disease (e.g., inflammatory bowel disease, colorectal cancer) is a major global health problem and threatening millions of lives. Animal models have been used to investigate potential drug candidates before clinical trials and provided considerable insights to understand veiled mechanisms of diseases. However, species differences resulted in poor prediction of drug responses in many cases. For this reason, there has been growing interest in developing in vitro intestine tissue models. Although current microfluidic-based intestine models are still extensively being used, they have inherent limitations in mimicking physiological conditions such as cell-cell and cell-matrix interaction and 3D complex epithelial structure of native tissues. Physiologically relevant 3D bioprinted tissue models that recapitulate tissue-specific microenvironmental niche can ease these challenges. In this study, we developed a colon-specific bioink material, Colon decellularized extracellular matrix (Colon dECM), derived from porcine tissue through decellularization wherewith we fabricated an intestine tissue model. Then, we identified the biochemical and biophysical characteristics of Colon dECM and established its printing process. It was found that Colon dECM promotes especially enteroendocrine functions of intestinal organoids compared to other ECM-derived material. Furthermore, 3D bioprinted intestine model with hollow lumen fabricated using Colon dECM showed spontaneous maturation and differentiation of encapsulated intestinal epithelial cells. Overall, Colon dECM is believed to be conducive to cellular maturation and self-organization and guiding tissue morphogenesis. We envisage developing an advanced in vitro model of the human intestine, which better captures the native physiological functions using the developed Colon dECM bioink, that can be utilized as a platform to study intestinal disease and its treatments.