Convergence of Biofabrication and Microphysiological Organ-on-a-Chip Technologies for High Throughput Screening

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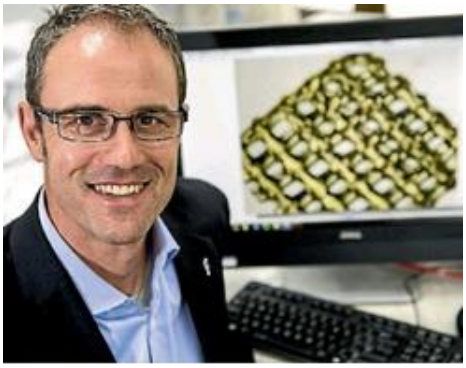
Abstract

Traditional 2D monolayer cell cultures and submillimeter 3D tissue construct cultures for tissue engineering or screening are limited in their ability to experimentally predict or mimic in vivo responses due to their simplistic organization and lack of stimuli. The rise of biofabrication and microphysiological systems (MPS) has sought to address this through development of techniques to spatially organize components of a tissue construct, and devices to supply these tissue constructs with an increasingly in vivo-like environment. Biofabrication technologies enable the generation of engineered constructs that replicate the complex organization of native tissues via the automated hierarchical placement of cell-laden bio-inks, tissue spheroids and bioactive factors. However, the disparity between MPS complexity and throughput represents a significant challenge. The convergence of automated biofabrication of complex biological models with advanced MPS design and additive manufacturing offers potential to address this dichotomy with experimental throughput. In this talk we describe development of versatile biomimetic and cell-instructive gelatin-based bioinks and biofabrication platform combined with a scalable dual-perfusion MPS bioreactor platform to support multi-organ-on-a-chip applications. Converging cell-instructive bioinks and biofabrication with a scalable dual perfusion bioreactor (MPS) platform represents to new paradigm in addressing 3D tissue complexity and throughput for screening and multi-organ-on-a-chip applications.

Biography



Tim Woodfield is Associate Professor of Regenerative Medicine at the University of Otago Christchurch New Zealand. He holds a prestigious Rutherford Discovery Fellowship from the Royal Society of New Zealand, and is Principal Investigator within the Medical Technologies Centre of Research Excellence (CoRE). His research technology platform involves complex 3D Biofabrication and Additive Manufacturing of biomaterial scaffolds and medical devices applied to regenerative medicine of cartilage and bone, including advanced 3D tissue culture models and high throughput screening. He has published over 105 peer reviewed journal articles, book chapters and published conference proceedings (h-index: 30). He has attracted over NZ$23 million in competitive research funding as a Principal or Named Investigator. He is the current President Elect and Executive Board Member of the International Society for Biofabrication (ISBF), and is the former President of the Australasian Society for Biomaterials & Tissue Engineering (ASBTE). He also sits on the Tissue Engineering and Regenerative Medicine International Society Asia Pacific (TERMIS-AP) Council, and is an Editorial Board Member for Biofabrication, APL Bioengineering, and Frontiers in Bioengineering & Biotechnology.