

# Designing Bioinks for 3D Bioprinting

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## Abstract

3D Bioprinting requires specialized bioinks that is able to be printed but also protect the cells during the printing process. These bioinks are often biomaterials with specific rheological properties that allows spatial extrusion in a layer-by-layer manner, but also being cyto-compatible to support cellular viability and function. In addition, photo-initiated radical polymerisation which is combining light and photo-initiators to generate radicals for crosslinking photo-polymerisable macromers has been employed in 3D biofabrication of cell-laden hydrogel constructs. The major advantage of using this technology is the spatio-temporal control over the crosslinking process, as well as being able to fabricate constructs with tailorable physico-mechanical properties. This lecture will cover the different design criteria required for bioinks, as well as the variety of materials being employed to manufacture these bioinks. Specific focus will be placed on the various chemistries used to synthesize polymers, photo-initiating systems to crosslink the polymers, as well as strategies to maintain bioprinted constructs' stability. Moreover, these chemistries and strategies will also be compared between different biofabrication platforms, including extrusion bioprinting, lithography-based technologies and bioassembly. The combination of various materials, crosslinking chemistries and photo-initiating systems is crucial in tailoring the biofabrication window to fit multiple applications.

## Biography

Dr Khoon Lim is currently a Senior Research Fellow and team leader at the University Of Otago Christchurch New Zealand. His research focuses on developing photo-polymerizable hydrogel bioinks for 3D bioprinting of functional tissues and also delivery of bioactive molecules to promote tissue regeneration. He has been awarded a total of > \$3 Million research grant funding (\$2 Million as PI), including the prestigious Emerging Researcher First Grant and Sir Charles Hercus Health Fellowship, both from the Health Research Council of New Zealand, and also a MARSDEN Fast Start Grant from the Royal Society of New Zealand. His research has also generated one full utility patent filed 7 different countries, where he's the lead inventor. He currently supervises 10 PhD students, 2 Masters students, and mentors 3 postdoctoral fellows. Dr. Lim is also Associate Investigator on the Centre of Research Excellence in Medical Technologies (MedTech CoRE), Affiliate Investigator on the Maurice Wilkins Centre (MWC) for Molecular Diversity, and Executive Committee member of the Australasian Society of Biomaterials and Tissue Engineering (ASBTE).

