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School of Pharmacy PhD Project 2017 / 2018

3D printed peptide loaded biomaterials as tailored osteo-regenerative bone implants

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3D printing, combined with novel biomaterial formulation, has the potential to revolutionise osteo-regenerative treatment, enabling the manufacture of implants tailored to individual patient wounds according to shape, size, required mechanical properties and degradation rate. There is already a high demand for functional bone grafts worldwide, for example; in the United States more than half a million patients receive bone defect repairs with a market value of greater than $2.5 billion annually.

This project will create a series of innovative polymeric, peptide loaded biomaterials capable of being printed into scaffolds with optimal mechanical and biological properties to ensure the regeneration of cells, bone and tissues. Using a unique thermoplastic additive manufacturing process, printing multi-material peptide loaded structures with variable internal architectures, we aim to produce a hyperelastic bone substitute that will aid bone remodeling and improve integration between existing bone tissue and the implant.

Peptides serve as the building blocks of proteins, the extracellular matrix and tissues and are therefore prime candidates for the creation of functional biopolymers for additive manufacturing and tissue engineering. Short self-assembling peptides can be manufactured to form nanofibrous 3D hydrogels in response to physiological conditions (pH, ionic strength). We have identified a number of short peptide motifs that are thermostable (to ~200°C), cheap and easy to synthesize relative to larger peptides utilised throughout medicine and are therefore amenable to manufacturing upscale by the pharmaceutical/biomaterial industries.

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How to Apply
Postgraduate applications should be made using Queen's University Direct Applications Portal. Please note that there are two application processes: one for admission to the university and another for postgraduate awards.

Further Information
Additional information for prospective postgraduate students can be found on the School of Pharmacy website and the Queen's Postgraduate website.

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