

School of Pharmacy PhD Project 2017 / 2018

Biocompatibility and cellular response to laser-treated metallic implants

Dr Louise Carson and Dr Chi Wai Chan

Metals are attractive for structural implant purposes, such as in orthopaedics or dentistry, owing to their high strength. Examples include titanium and cobalt-based alloys. The ideal permanent implant would be completely 'inert', showing no degradation in response to the corrosive conditions of a biological environment (which may impair mechanical properties or release toxic degradation products), and cause little or no foreign body response (FBR, a chronic inflammatory response directed against the implanted material).

Unfortunately such a state of complete inertness has not been achieved for any material to date.

The clinical significance of an adverse host/implant interaction is potentiation of implant failure, "aseptic loosening", or even a microenvironment hospitable to the establishment of infection should pathogens be introduced at the implant site.

This project aims to thoroughly characterise, using techniques established within Dr Carson's research group, the biological responses to a range of surface-modified alloys developed by Dr Chan using advanced laser technology. We have previously demonstrated the superior physical, mechanical, and antimicrobial properties of laser surface modification, however the effects on biocompatibility are yet unknown.

The student will use molecular biological techniques and cell culture assays to investigate the biological response to these materials. Focus will be afforded to interactions with macrophages and macrophage-derived multinucleate cells, namely osteoclasts (important in implant osseointegration), and foreign body giant cells (FBGCs, the hallmark of the FBR). Together these cell types are important mediators of biocompatibility and will provide an indication of in vivo performance of the implant materials.

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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](#).