Department of Biomedical Engineering
The Chinese University of Hong Kong

Biomaterials for multidrug-resistant implant infection: bacteriophages and beyond



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Time : 4:45 pm
Venue : Room 1122, William M W Mong Engineering Building, CUHK

Abstract

Fracture-related infection (FRI) remains a major challenge in musculoskeletal trauma, with treatment complicated by biofilm formation, protected bacterial communities and increasing antimicrobial resistance. These challenges have created a need for new therapeutic strategies that can act locally and target bacteria that are difficult to eradicate with conventional antibiotics.

In this talk, I will present our work exploring bacteriophages and phage-derived technologies for the treatment of Staphylococcus aureus FRI. We first investigated local delivery of bacteriophages in combination with antibiotics using a carboxymethyl-cellulose hydrogel. The hydrogel maintained phage activity and provided sustained local release, while treatment combining local phage delivery with systemic vancomycin reduced bacterial burden in soft tissue, bone and implants in an experimental FRI model.

Building on this approach, we explored phage-derived lytic enzymes as a next-generation strategy to more directly target bacteria within protected communities. Engineered FibriLysins were designed to combine fibrinolytic activity with direct bacteriolytic activity, allowing simultaneous disruption of the protective fibrin environment and killing of *S. aureus*. FibriLysins showed strong activity against biofilms and abscess-like bacterial communities, and the lead molecule achieved greater reductions in bacterial burden than standard antibiotic therapy in an experimental FRI model, while disrupting bacterial aggregates without impairing bone healing.

Together, these studies demonstrate the evolving potential of phage-based therapies for implant-associated infection, progressing from local delivery of whole bacteriophages toward engineered phage-derived molecules designed to overcome specific biological barriers to treatment. Such approaches may ultimately complement conventional antimicrobial therapy and provide new options for difficult-to-treat fracture-related infections.

Biography

Dr Fintan Moriarty is Principal Investigator and Leader of the Musculoskeletal Infection team at the AO Research Institute Davos in Switzerland. He has extensive expertise in the application of preclinical in vivo models to address clinically relevant questions on the problem of fracture-related infection. Particular interests have been the development of prophylactic and therapeutic strategies against FRI, including those caused by antibiotic resistant pathogens. He has published over 60 peer-reviewed articles and book chapters, and has served as editor of a book on biomaterial associated infection.

***** ALL ARE WELCOME *****

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