

Stem cell-based regenerative therapies for bone and joint diseases

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Musculoskeletal conditions including bone and joint diseases are leading contributors to the chronic disease burden, affecting 1 in 3 people worldwide. In addition to causing significant disability and decline in quality of life, they also greatly increase the risk of death from other concurrent diseases such as cardiovascular disease. These conditions have no cure, and their long-term management imposes an enormous burden on global healthcare systems.

My research program in regenerative medicine has the broad aim of fulfilling unmet clinical needs in treating chronic bone and joint conditions. My recent work has focused on regenerative therapies for joint diseases, using osteoarthritis as a model disease. Among emerging therapies, mesenchymal stem cells (MSCs) have been frequently tested due to their natural anti-inflammatory and restorative functions. However, the efficacy of MSC therapy for osteoarthritis treatment is limited by some key factors, which our team has sought to address by (1) using microcarrier systems to improve the efficiency of cell delivery and cell viability after injection, and (2) optimising 3D culture methods to enhance MSC paracrine activity.

Interestingly, our recent work also demonstrated that live MSCs may adopt the diseased characteristics of the osteoarthritic joint after injection, hence reducing their therapeutic benefits. This prompted us to look into the MSC secretome, and generate cell-derived bio-therapeutics as a new treatment option for osteoarthritis. We hope that our combined therapeutic discovery strategy can in the future be adapted for other types of chronic diseases.