Proteins, peptides and advanced cell therapies to treat heart failure

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Cardiovascular disease accounts for more deaths and health expenditure than any other disease in Australia. New therapies are urgently needed. Heart failure is a major culprit with costs in Australia of >\$1 billion p.a. Heart transplantation is the only viable long term option for patients at severe stages of heart failure but there is a dire world-wide shortage of donor hearts. This problem is exacerbated by our ageing population.

This presentation will discuss the clinical challenge of heart failure and possible opportunities for nanomedicine. This will be framed in the context of Prof Chong's recent work including delivery of recombinant proteins and peptides ^{1,2} that target the cardiac matrix, vasculature and inflammatory milieu or advanced cellular therapies using induced pluripotent stem cell derived cardiomyocytes³ to provide new force-generating muscle to the failing heart.

References:

¹ Robert Hume ... James JH Chong. "Tropoelastin improves post-infarct cardiac function by increasing scar elastin". Circulation Research 2023. 132:72-86_<u>https://doi.org/10.1161/CIRCRESAHA.122.321123</u>

² Sujitha Thavapalachandran... **James JH Chong**. "Platelet-derived growth factor-AB improves scar mechanics and vascularity after myocardial infarction". **Science Translational Medicine 2020. Vol 12** (524):eaay2140. <u>https://doi.org/10.1126/scitranslmed.aay2140</u>

³Dinesh Selvakumar, ...James J.H.Chong. "Cellular heterogeneity of pluripotent stem cell-derived cardiomyocyte grafts is mechanistically linked to treatable arrhythmias". Nature Cardiovascular Research 2024. 3:145-165. <u>https://doi.org/10.1038/s44161-023-00419-3</u>