Docket #: S22-436

A method to generate cardiac pericytes from human induced pluripotent stem cells

Researchers at Stanford University have developed a novel method for the first time to generate cardiac pericytes from human induced pluripotent stem cells that closely resemble primary cells. This discovery could lead to a more effective research model for coronary microvasculature dysfunction, as well as present a platform for drug screening or stem cell therapy.

Cardiac pericytes are an abundant cell type in the heart, thought to play an important role in the maintenance of coronary microvasculature, yet are relatively understudied. Coronary microvascular dysfunction is increasingly recognized in types of cardiovascular disease, underlining the need for more effective studies of cardiac pericytes under pathophysiological conditions. However, this goal was not readily achievable due to the scarcity of human primary cardiac pericytes. To circumvent this technical bottleneck, the inventors developed a stepwise differentiation protocol with precise activation or inhibition of key morphogens at each step, yielding pure progenitor cells and induced cardiac pericytes (named "iPSC-CPs") that share comparable levels of cell markers as primary cardiac pericytes, as well as in vivo functional characteristics. This method represents a first-of-its-kind in the field, and thus may lead to a more effective research and therapeutic platform for coronary microvascular disease.

Stage of Development
Proof of concept

Applications

- Off-the-shelf iPSC-CPs or differentiation kits for research use

- Drug discovery and/or toxicity screening platform from cancer drug-induced cardiotoxicity
- Autologous stem cell therapy for cardiac ischemic injury from patient-specific iPSCs

Advantages

- A defined and robust method with high induction efficiency of iPSC-CPs that are closely comparable to primary cardiac pericytes
- Immediate potential as a research platform for the coronary microvascular system
- With greater study, therapeutic platform potential

Publications

- Mengcheng Shen, Chun Liu, Shane Rui Zhao, Amit Manhas, Laksshman Sundaram, Mohamed Ameen and Joseph C. Wu. Stepwise Generation of Human Induced Pluripotent Stem Cell–Derived Cardiac Pericytes to Model Coronary Microvascular Dysfunction." *Circulation.* Vol. 147, Issue 6:515–518 (Feb. 7, 2023).
- Mengcheng Shen, Shane Rui Zhao, Yaser Khokhar, Li Li, Yang Zhou, Chun Liu, Joseph C Wu. "Protocol to generate cardiac pericytes from human induced pluripotent stem cells." *STAR Protoc.* 2023 Apr 27;4(2):102256. doi: 10.1016/j.xpro.2023.102256 (April 27, 2023).

Patents

- Published Application: WO2024123790
- Published Application: 20260201335

Innovators

- Joseph Ching-Ming Wu
- Mengcheng Shen

Licensing Contact

Kimberly Griffin

Technology Licensing and Strategic Alliances Manager

Email