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GENERATION OF CARDIAC LINEAGES FROM HUMAN INDUCED PLURIPOTENT STEM CELLS: THE CURRENT PROGRESS

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SUMMARY

Cardiovascular diseases remain the main cause of death worldwide. Although effort to repair damaged heart with adult stem cells is still ongoing, the outcome from past clinical trials reported only with limited success. Induced pluripotent stem cells (iPSCs), reprogrammed from somatic cells, regain pluripotency and become the most promising cell type to study heart development and cellular differentiation in vitro. These cells are also the precursors to acquire specific autologous cells for therapy or disease modeling, with significantly lesser ethical concerns as compared to embryonic stem cells. Despite the understanding of the lineage-determining signaling pathways, directed differentiation of iPSCs *in vitro* often yield heterogenous cell population. Substantial progress has been made to increase differentiation efficiency and purification strategy to improve cell homogeneity, with the aim to eliminate undifferentiated pluripotent cells and make the end-product suitable for transplantation. Recent breakthroughs in developmental study proposed derivation of specific stem/progenitors from iPSCs in order to drive differentiation of more specific heart cells, including atrial cells, ventricular cardiomyocytes, pacemaker cells and epicardial cells. Our work focuses on derivation of proepicardial cells and ventricular cardiomyocytes to study their interactions, effects in cardiac microtissues and the potential applications in tissue engineering.