Induced pluripotent stem cell-derived cardiomyocytes for precision medicine in cardiovascular diseases

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Cardiovascular genetic diseases are a major cause of morbidity and the leading cause of sudden cardiac death in young subjects. Even though significant progresses have been made in the understanding of these genetic disorders, there are still several open issues needing elucidation. The major limitation in studying inherited cardiovascular diseases at cellular level has been the lack of patient-specific cardiomyocytes since they cannot be easily obtained from patients, and the in vitro and in vivo models currently available are often inadequate for the purpose. The paradigm-shift that followed the development of induced pluripotent stem cells (iPSCs) has changed both our perspective and research potential. Now, by simply collecting somatic cells from a patient, we can obtain CMs derived from the iPSCs (iPSC-CMs) of the same subject in just a few weeks able to recapitulate the abnormal cardiac phenotype of hereditary cardiac arrhythmias. Recent studies have shown that this cellular model can be successfully utilized for the implementation of Precision Medicine approaches to better handle inherited cardiovascular diseases, such as Long QT Syndrome (LQTS), taking into account individual genetic and phenotypic variability, and allowing the identification of more targeted diagnostic and therapeutic strategies.