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LETTER

Gene Expression, Morphology, and Electrophysiology During the Dynamic Development of Human Induced Pluripotent Stem Cell-Derived Atrial- and Ventricular-Like Cardiomyocytes [Letter]

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Dear editor

The study titled "Gene Expression, Morphology, and Electrophysiology During the Dynamic Development of Human Induced Pluripotent Stem Cell-Derived Atrial- and Ventricular-Like Cardiomyocytes" presents a valuable investigation into the dynamic development of human induced pluripotent stem cell-derived atrial-like (iPS-AM) and ventricular-like (iPS-VM) cardiomyocytes.[1] The authors employ a small molecule-based approach to modulate retinoic acid and bone morphogenetic protein signaling pathways during differentiation. Their comprehensive assessment, integrating gene expression, morphology, and electrophysiological function,[2] offers valuable insights into the maturation process of these cell types. A key strength of this work lies in its multifaceted approach. By employing immunofluorescence, qRT-PCR, flow cytometry, and electron microscopy, the authors demonstrate a coordinated increase in pan-cardiomyocyte markers[3] (TNNT2, ACTN2) alongside chamber-specific markers (NPPA, MYL7, KCNJ5 for iPS-AM; GJA1, MYL2, CACNA1C for iPS-VM). This detailed characterization underscores the progressive acquisition of chamber-specific phenotypes during differentiation. Furthermore, the study effectively captures the dynamic changes in cell morphology. The observed transformation of cTnT organization from a scattered pattern to a well-defined sarcomeric structure in both iPS-AMs and iPS-VMs highlights the maturation of contractile machinery.[4] Additionally, the dynamic shift in mitochondrial abundance and lipid droplet content suggests a metabolic reprogramming that aligns with functional development.[5] While the study effectively demonstrates dynamic changes in gene expression and morphology, a deeper exploration of the electrophysiological maturation is warranted. Although resting and action potential amplitudes remained similar, the observed prolongation of action potential duration during development requires further investigation. Future studies could explore the underlying ionic currents and channel expression profiles to provide a more comprehensive understanding of electrophysiological maturation. In conclusion, the work by Yafei Zhou sheds light on the dynamic development of human iPSC-derived cardiomyocytes. Their findings hold significant promise for advancing our understanding of heart development and potentially paving the way for future applications in disease modeling and regenerative medicine. Further research delving deeper into electrophysiological maturation and potentially incorporating functional assays could offer even richer insights into this vital process.

Disclosure

The authors report no conflicts of interest in this communication.

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