EFFECTIVE HYPOTHERMIC STORAGE OF HUMAN PLURIPOTENT STEM CELL-DERIVED CARDIOMYOCYTES COMPATIBLE WITH GLOBAL DISTRIBUTION OF CELLS FOR CLINICAL APPLICATIONS AND TOXICOLOGY TESTING

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Key Words: Cell therapy; Human pluripotent stem cell-derived cardiomyocytes; Hypothermic storage; Three-dimensional aggregates; Two-dimensional monolayer cultures

The applicability of human pluripotent stem cell-derived cardiomyocytes (hPSC-CMs) in the clinic/industry is highly dependent on the development of efficient methods for worldwide shipment of these cells. Here, we evaluated the feasibility to cold store monolayers and aggregates of functional CMs obtained from different PSC lines using a fully defined clinical-compatible preservation formulation and investigated the time frame that hPSC-CMs could be subjected to hypothermic storage.

We showed that two-dimensional (2D) monolayers of hPSC-CMs can be efficiently stored at 4°C for 3 days without compromising cell viability. However, cell viability decreased when the cold storage interval was extended to 7 days. We demonstrated that hPSC-CMs are more resistant to prolonged hypothermic storage-induced cell injury in three-dimensional aggregates than in 2D monolayers, showing high cell recoveries (>70%) after 7 days of storage. Importantly, hPSC-CMs maintained their typical (ultra)structure, gene and protein expression profile, electrophysiological profiles, and drug responsiveness.

This study provides important insights into the cold preservation of PSC-CMs that could be valuable in improving global commercial distribution of hPSC-CMs.