CDB SEMINAR

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16:00-17:00 A7F Seminar Room

Derivation of scalable vasculogenic precursors from human pluripotent stem cells during the onset of vasculogenesis

Summary

Human pluripotent stem cells (hPSCs), either embryonic (hESCs) or induced (iPSCs), which self-renew indefinitely, offer a plentiful cell source for regenerative vasculogenesis. Further scaling up in PSC numbers can be achieved by using the 3-dimentional, feeder free platform for long-term simultaneous cultivation of undifferentiated, PSCs, which in turn can be used to produce scalable quantities of vasculogenic cells.

Current protocols for derivation of vasculogenic cells from hPSCs can be used for generation of two out of three major types of blood vessel residing cells, including endothelial and smooth muscle cells but not pericytes of microvessels and capillaries. Since adult tissue-derived pericytes exhibit mesenchymal stem cell-like characteristics and considering the shortage in obtainable human pericytes, hPSCs may serve as promising source for pericytic-equivalents.

We found that in the course of vasculogenesis in spontaneously developing PSC-derived embryoid bodies, a subset of $CD105^{+}CD73^{+}CD90^{+}CD31$- appeared in parallel to the emergence of CD31+ endothelial progenitor cells. In culture, the majority of isolated $CD105^{+}CD31^{-}$ expanded cells exhibited pericytic-morphology and expressed pericyte specific markers, including NG2 and PDGFR-β but not α-smooth muscle actin. When implanted with hPSC-derived endothelial cells into immunodeficient mice, hPSC-derived pericytes supported efficient and rapid formation of functional vascular network. In addition, long-term cultured pericytes expressed mesenchymal stem cells markers with multilineage osteogenic, adipogenic, chondrogenic and myogenic differentiation.

While numerous concerns should be address before potential practical usage of hPSCs in applicative clinical tissue vascularization, the rapidly growing platform of iPSC from multiple cell types is already available for disease modeling in vitro, studies of reprogramming as well as PSC –based developmental research.

Host:
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