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Cardiac endothelial progenitor cell promotes angiogenesis in mouse hindlimb ischemia

The number of the circulating blood endothelial progenitor cells (EPCs, typically $CD34^+/KDR^+$) appears inversely related to cardiovascular mortality, indicating the potential roles in cardia repairing. The present study aims to isolate and characterize the putative cardiac EPCs (cEPCs) at both *in vitro* and *in vivo* settings. Human cardiac stem cells were enzymatically isolated from atrial appendages. The isolated cells underwent c-kit and CD31 magnetic activated cell sorting (MACS) from passages 1 to 3. At every other passage up to passage 10, the cells were then collected for various analyses including immunostaining, flow cytometry and functional assays for endothelial cells (ECs). Cardiac lineage differentiation was induced with 10 M 5-azacytidine and evaluated with immunostaining & RT-PCR. Our results showed that tissue sections and freshly-isolated cells from atrial appendages contained <1% $c\text{-}kit^+$ cells among the total nuclei counted. However following MACS, the purified $c\text{-}kit^+/CD31^+$ cell population (termed cEPCs) demonstrated typical morphology of ECs and positive for KDR, vWF, VE-cadherin, CD34, GATA4 and Nkx2.5, but negative for CD45, CD133 and Lin. Furthermore, these cells exhibited the capacity to form capillary structures and to uptake Dil-AC-LDL dye, both unique properties of ECs. After differentiation, almost all of cEPCs became mature ECs. The transplanted cEPCs significantly increased the blood flow and rescued the ischemic hindlimb from necrosis. We concluded that human atrial appendage contains resident cEPCs ($c\text{-}kit^+/CD31^+$) with the biological and functional properties typical for ECs. *In vivo* transplantation of cEPCs protects the ischemic hindlimb from necrosis which is likely through enhanced angiogenesis.

Biography

Jia-Qiang has earned his PhD at Peking Union Medical University, Beijing, China. He has obtained his Postdoctoral training in the fields of cardiovascular and stem cell biology at the University of Wisconsin-Madison. Currently, he is an Assistant Professor of Department of Biomedical Sciences & Pathobiology, Virginia Polytechnic Institute and State University. His major research interests include stem cell biology, cardiac lineage differentiation, cardiomyocytes electrophysiology and functional maturity, stem cell tissue engineering and stem cell transplantation in animal model.

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