Endothelial progenitor cell

Endothelial progenitor cell (or EPC) is a term that has been applied to multiple different cell types that play roles in the regeneration of the endothelial lining of blood vessels. Despite the history and controversy, the EPC in all its forms remains a promising target of regenerative medicine research.

The importance of flow shear stress (SS) on the differentiation of endothelial progenitor cells (EPCs) has been demonstrated in various studies. Cholesterol retention and MicroRNA regulation have been also proposed as relevant factors involved in this process, though evidence regarding their regulatory roles in the differentiation of EPCs is currently lacking.

In a study Li et al. on high shear stress (HSS)-induced differentiation of EPCs, they investigated the importance of ABCA1, an important regulator in cholesterol efflux, and miR-25-5p, a potential regulator of endothelial reconstruction. They first revealed an inverse correlation between miR-25-5p and ABCA1 expression levels in EPCs under HSS treatment; their direct interaction was subsequently validated by a dual luciferase reporter assay. Further studies using flow cytometry and qPCR demonstrated that both miR-25-5p overexpression and ABCA1 inhibition led to elevated levels of specific markers of endothelial cells (ECs), with concomitant down-regulation of smooth muscle cell (SMC) markers. Finally, knockdown of ABCA1 in EPCs significantly promoted tube formation, which confirmed the conjecture. This current results suggest that miR-25-5p might regulate the differentiation of EPCs partially through targeting ABCA1, and such a mechanism might account for HSS-induced differentiation of EPCs [1)].

Garbuzova-Davis et al., evaluated via electron microscopy the ability of transplanted human bone marrow endothelial progenitor cells (hBMEPCs) to repair the BBB in adult Sprague-Dawley rats subjected to transient middle cerebral artery occlusion (tMCAO). ß-galactosidase pre-labeled hBMEPCs were intravenously transplanted 48 hours post-tMCAO. Ultrastructural analysis of microvessels in non-transplant stroke rats revealed typical BBB pathology. At 5 days post-transplantation with hBMEPCs, stroke rats displayed widespread vascular repair in bilateral striatum and motor cortex, characterized by robust cell engraftment within capillaries. hBMEPC transplanted stroke rats exhibited near normal morphology of endothelial cells, pericytes, and astrocytes, without detectable perivascular edema. Near normal morphology of mitochondria was also detected in endothelial cells and perivascular astrocytes from transplanted stroke rats. Equally notable, they observed numerous pinocytic vesicles within engrafted cells. Robust engraftment and intricate functionality of transplanted hBMEPCs likely abrogated stroke-altered vasculature. Preserving mitochondria and augmenting pinocytosis in cell-based therapeutics represent a new neurorestorative mechanism in BBB repair for stroke. [2)].

EPCs transplantation can participate in the reparative procedure of the neovascularization in oxygen-induced retinopathy (OIR) [3)].

The relative increase in angiopoietin 2 activity in brain tumors may result in the creation of a pro-angiogenic environment that enhances the recruitment of putative bone marrow-derived endothelial progenitor cell into the tumor's developing vascular tree [4)].

1)
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2)
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3)
Wang D, Zhang B, Shi H, Yang W, Bi MC, Song XF, Zhang C, Cheng JH, Hao JL, Song E. Effect of endothelial progenitor cells derived from human umbilical cord blood on oxygen-induced retinopathy in mice by intravitreal transplantation. Int J Ophthalmol. 2016 Nov 18;9(11):1578-1583. PubMed PMID: 27990359.
4)
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