

Endothelial Progenitor Cells

Characterization and Role in Vascular Biology

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Abstract—Infusion of different hematopoietic stem cell populations and ex vivo expanded endothelial progenitor cells augments neovascularization of tissue after ischemia and contributes to reendothelialization after endothelial injury, thereby, providing a novel therapeutic option. However, controversy exists with respect to the identification and the origin of endothelial progenitor cells. Overall, there is consensus that endothelial progenitor cells can derive from the bone marrow and that CD133/VEGFR2 cells represent a population with endothelial progenitor capacity. However, increasing evidence suggests that there are additional bone marrow–derived cell populations (eg, myeloid cells, “side population” cells, and mesenchymal cells) and non-bone marrow–derived cells, which also can give rise to endothelial cells. The characterization of the different progenitor cell populations and their functional properties are discussed. Mobilization and endothelial progenitor cell–mediated neovascularization is critically regulated. Stimulatory (eg, statins and exercise) or inhibitory factors (risk factors for coronary artery disease) modulate progenitor cell levels and, thereby, affect the vascular repair capacity. Moreover, recruitment and incorporation of endothelial progenitor cells requires a coordinated sequence of multistep adhesive and signaling events including adhesion and migration (eg, by integrins), chemoattraction (eg, by SDF-1/CXCR4), and finally the differentiation to endothelial cells. This review summarizes the mechanisms regulating endothelial progenitor cell–mediated neovascularization and reendothelialization. (*Circ Res.* 2004;95:343-353.)

Key Words: progenitor cells ■ neovascularization ■ vasculogenesis ■ angiogenesis ■ endothelial cells