**STEM CELLS AND VASCULAR DISEASE**

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It is established that mature endothelial cells can proliferate and replace damaged cells in the vessel wall. However, recent findings indicate an impact of stem and progenitor cells in repair process of the vessel wall. And also stem cells can differentiate into smooth muscle cells (SMCs) that may be useful for regenerate a vessel. This presentation aims to briefly summarize the recent findings in stem cell research relating to the role of the cells in vascular remodelling. It has been demonstrated that stem cells present in the vessel wall may contribute to endothelial repair and SMC accumulation in the neointima. Recently, we have developed an efficiency method for producing a large number of vascular SMCs from stem cells, and demonstrated for the first time that collagen IV plays a crucial role in the early stage of SMC differentiation from stem cells. To identify potential signal transducers mediating SMC differentiation from stem cells, gene expression profile and nucleus proteomics techniques were applied in the recent studies. We demonstrated that upstream activators or regulators for the transcription factors of SMC differentiation, such as reactive oxygen species, histone deacetylases, microRNAs, Cbx3, extracellular matrix proteins and integrins. In this presentation I, therefore, aim to briefly summarize recent progress in the mechanism of stem cell differentiation into SMCs to highlight the potential targets for promoting/inhibiting SMC differentiation useful for vessel-tissue engineering and treatment of vascular disease. These findings indicate a potential of stem cell therapy for vascular disease.