Differentiation of Mesenchymal Stem Cells Derived from Human Embryonic Stem Cells to Endothelial Cell

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Mesenchymal stem cells (MSC) derived from human embryonic stem cells (hESC) can give rise to cells from a number of mesodermal lineages, such as bone, cartilage, fat, skeletal muscle, and hematopoietic lineages but have not yet been demonstrated to differentiate into endothelial cells. In this study, we purified MSC from hESC by a novel approach employing retroviral vectors to transduce the hESC, and showed that these cells can differentiate to cells with multiple endothelial cells markers. We took advantage of the different molecular handling of genes transferred by MMLV-based retroviral vectors by hESC and MSC. While hESC efficiently silence genes transferred by MMLV-based retroviral vectors, MSC do not silence the transferred genes. We transduced hESC with MMLV-based retroviral vectors encoding VEGF and neomycin phosphotransferase. After gene transfer we used G418 in the culture media. hESC died under G418 regiment due to transgene silencing while MSC that differentiated from hESC survived G418 selection and differentiated to cells with multiple endothelial markers such as VE-cadherin, vWF, and tie-2. The differentiated cells formed a robust capillary-like network when seeded on Matrigel.
We conclude that hESC-derived MSC can be derived to differentiate to endothelial cells and that this process can help in studying the differentiation and maturation of endothelial cells.