

Dopaminergic neurons formation and differentiation from the gene modified human adipose-derived mesenchymal stem cells in 3D scaffold

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Recent studies shown stem cell-based therapy can potentially improve the clinical outcome of Parkinson's disease (PD). However, issues concerning the purported efficiency of dopaminergic (DA) neuron generation and the characterization of transformed cells, indicate the need for new approaches. Here, we describe the development of neurons from human adipose-derived mesenchymal stem cells (AMSCs) with the transgene Lmx1a, Pitx3, Mash1, Ngn2 by co-culturing with astrocytes in three-dimensional (3D) scaffold composed of poly-lactic-co-glycolic acid (PLGA) and carbon nanotubes (CNTS) in perfused microbioreactors. After 40 days in the microbioreactors, about 70% AMSCs showed morphology of neurons, expressed β -III-Tubulin, MAP2 and were positive for synaptic proteins including synaptophysin and bassoon body. Moreover, the 3D scaffold promoted DA neurons differentiation of expanded cells resulting in improved morphological maturation, tyrosine hydroxylase expression and dopamine release. Lmx1a, Pitx3, Mash1, Ngn2 as an important gene in the dopaminergic neuron growth and development process promoted the differentiation of AMSCs. to DA greatly. Thus, our results provide that by improving expansion and differentiation of AMSCs. with the gene modify in the 3D scaffold, AMSCs could be a ready source of adult stem cells with DA neuronal differentiation potential, and may be a useful tool to treat PD. It is clear that future works would have to focus on synaptic transmissions between astrocytes from AMSCs, the electrophysiological properties of AMSCs, as well as the functional integration and clinical improvement after transplantation of AMSCs *in vivo*.

Biography

Lin Song, Ph.D. student, studies in Dalian University of Technology in China. She has focused on mesenchymal stem cells neurogenic differentiation for 2 years at Regenerative Medicine Center in The First Affiliated Hospital of Dalian Medical University. Now she is doing her another project about neuron development at Department of neurosciences of University of Geneva.

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