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Production of GABAergic neurons differentiated from BMSCs- derived - neurosphere cells: Application in spinal cord injury

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Objective: GABAergic neuron is an important cell in the development of central nervous system. Bone marrow stromal stem cells (BMSCs) can be grown in aggregates called neurospheres and then to neural and glial cell under appropriate conditions in laboratory. However differentiation of neurosphere into Gamma-aminobutyric acid (GABA)ergic neurons poorly understood.

Material and methods: In this study BMSCs of adult female rats were expanded and then induced into neurospheres in the presence of epidermal growth factor (EGF), basic fibroblast growth factor (bFGF) and B27, followed by induction into GABAergic neurons with Retinoic acid and ciliary neurotrophic factor (CNTF). BMSC were evaluated for stemness by mesenchymal stem cell markers antiCD(105,106,90) and fibronectin. the mean percentage of nestin, neurofilaments 68,160 and 200, and specific markers of GABAergic neurons (GAD65/67, VGAT & GABA antibodies) immunoreactive cells were used to evaluate the GABAergic differentiation at the end of induction stage.

Results: The yield of GABAergic neurons was about 70%. in addition RT-PCR showed expression of GAD1/2 and VGAT in GABAergic neurons 4 day after treatment of neural stem cells with RA and CNTF.

Conclusion: The use of GABAergic neurons improve the spasticity resulted the spinal cord injury. The result of the study showed that exposure of neural stem cell driven neurosphere (NSc-DN) to Retinoic acid (RA) and CNTF promote differentiation of these cells into GABAergic neurons. Thus, GABAergic neurons obtained from NSc-DN are promising type of neural stem cell for repair of injured spinal cord.

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