



International Conference & Exhibition on Cell Science & Stem Cell Research

29 Nov - 1 Dec 2011 Philadelphia Airport Marriott, USA

Induction of neural differentiation, neurite extension and their networking through human umbilical cord derived stromal cells secreted trophic factors

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Human umbilical cord is a highly abundant, non controversial source with tremendous potential for Mesenchyma stem cells (MSCs). We derived matrix stromal cells (HUMS) from the human umbilical cord. The HUMS cells secrete several neurotrophic factors. The HUMS cells and their secreted factors are shown to provide some amount of neuroprotection in the neurodegenerative disease models of mice. But the exact mechanism of protection is not well understood. Here, we report that the HUMS cells -secrete six neurotrophic factors, namely, NT-3, NGF, BDNF, VEGF, IGF-1 and GDNF(NFs). These NFs present in the conditioned medium of the HUMS cells induce differentiation, neurite extension and neural networking of a motor neuron cell line, NSC34. These motor neurons express the tyrosine kinase receptors for the above trophic factors (except for BDNF), which are crucial for neurite extension. The tyrosine kinase inhibitor, K252a, drastically reduces CM induced neurite extension. Further, all the 5 TFs need to be neutralized simultaneously with their antibodies to abrogate neurite extension, proving the flexibility and prudent backup mechanism of the system. Intriguingly, none of the phenomenon – differentiation, neurite extension or neural networking required cAMP second messenger system coupling as evidenced by cAMP pathway activator or inhibitor treatment of the NSC34 cells with or without CM.

Biography

Jamuna R. Subramaniam has completed her Ph.D. from Georgetown University, Washington DC and PDF from Johns Hopkins University, Baltimore. Currently, she is Senior Research Scientist in Indian Institute of Technology Kanpur, India. She has around 17 publications in reputed journals.