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Poster Presentation

Laminin Based Tissue Engineering for Central Nervous System Regeneration

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Abstract

Central nervous system (CNS) architecture damages, which can be induced by physical injuries during road accidents, often result in the loss of neuronal cell bodies, axons, and associated glia support. But, there is no currently definite treatment for CNS degeneration. Tissue engineering aims to restore the function of living tissues by replacing damaged tissues or organs. Natural or synthetic scaffolds that match the mechanical properties of the native tissue can be used to foster the growth of cells. Cell-cell adhesion and cell-extra cellular matrix (ECM) adhesion are crucial for tissue formation and maintenance of structural integrity. Tissue engineering strategies can involve analyzing the interactions between cells and the ECM, and evaluated changes in cell behavior in various contexts. Identification of binding sites and key motifs in ECM proteins that interact with cellular receptors will allow researchers to generate small peptides that can mimic the function of large ECM proteins. It is crucial that these small peptides are able to interact with the same cell surface receptor(s) as their parent ECM molecule and activate the appropriate signaling pathways that are consistent with the phenotype expected. One of the important ECM proteins is laminins consisting of α , β , and γ chains. Laminins are required for basement membrane assembly and they regulate cellular behavior through interactions with cell surface receptors, including integrins, syndecans, and α -dystroglycan. Recent studies showed that recombinant laminin-511 E8 ($\alpha 5\beta 1\gamma 1$) fragments are useful matrices for maintaining human embryonic stem cells (hESCs) and human induced pluripotent stem cells (hiPSCs). Using this system, hESCs and hiPSCs can be easily and stably passaged by dissociating the cells into single cells for long periods, without any karyotype abnormalities. The use of laminin-511 may provide permissive microenvironments to enhance cell survival and control neural stem cell fate, both in vitro and in vivo by holding and precisely delivering stem cell based treatments for CNS regeneration.

Keywords: Human Embryonic Stem Cell, Tissue Engineering, Laminin.

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