Abstract of Presentation

Presentation Title

Design of artificial basement membrane using laminin active peptides

Name (Underline the family name)

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Abstract

Biomaterials that provide a support or scaffold for tissue formation play key roles in virtually tissue engineering approaches. Extracellular matrix (ECM) components including laminin, collagen, and fibronectin, and their active peptides are potential candidates for affording the cell binding activities to materials. Laminins are a major component of basement membrane, a thin ECM, and have diverse biological activities. Our goal is to identify active sequences from laminin and to use the biologically active peptides for biomaterials as an artificial basement membrane. We already have identified various biologically active peptides from laminins using more than 3,000 synthetic peptides. These peptides recognized various cellular receptors and have the potential ability to serve as bio-adhesiveness for tissue engineering. Here, we prepared various peptide-polysaccharide complexes using the laminin active peptides and polysaccharides, including chitosan, alginate, agarose, and hyaluronic acid, and examined their biological activities. Most of the peptide-polysaccharide complexes showed cell attachment activity and neurite outgrowth activity, and the activities were higher than that of peptide alone. The morphological appearance of the attached cell is found to depend on the peptides and physical properties of the polysaccharides. Further, the mixed peptide-polysaccharide complexes using various receptor specific peptides interact simultaneously with several cellular receptors and mimic the cell adhesion of a multifunctional protein, suggesting that the mixed-peptide approach has potential as a multifunctional biomaterial for cell and tissue engineering. These results suggest that the receptor type of ligands and physical properties of scaffolds are critical for cellular functions. In this study, we focus on hESC-based regenerative therapy for Parkinson patients. To generate tumor-risk-free, viable, and functional dopamigenic (DA) neurons, we are developing an ECM-mimetic platform for enrichment of differentiated cells, and to enhancing survival and integration of transplanted DA neurons, we are developing an ECM-mimetic scaffold for recreation of protective ECM microenvironment at the transplantation site. The laminin peptide-polysaccharide complexes have a potential to be used as an artificial basement membrane, an ECM-mimetic material, for regenerative therapy.