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Characterization of UNC-50 and its role in development of periodontal tissue and mechanical stress-induced cementogenesis

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The human periodontal ligament(PDL) is the soft, specialized, connective tissue interposed between the cementum covering the root of the tooth and the bone forming the socket wall. PDL fibroblasts have the ability to differentiate into mineralized tissue-forming cells such as the cementoblasts responsible for cementum formation and the osteoblasts that form alveolar bone. Thus, PDL fibroblasts are thought to play crucial roles for not only homeostasis of periodontal tissue but also in bone remodeling, wound healing, and regeneration of the tissue. Although biological functions of PDL fibroblasts have been extensively investigated, little is known about the molecular mechanisms related to the development and differentiation of PDL fibroblasts.

Gingival fibroblasts and PDL fibroblasts are located closely to each other in the tooth periodontium and are of the same fibroblast group. However, their embryologic origins are different. Gingival fibroblasts are of mesenchymal origin, whereas PDL fibroblasts are of ectomesenchymal origin. Furthermore, PDL fibroblasts differ in many ways from gingival fibroblasts in various characteristics, including their high alkaline phostphatase activity, parathyroid hormone responsiveness, production of bone-like matrix protein, and expression of osteoblasts phenotype such as the formation of mineralized nodules. We speculated that genes or molecules uniquely expressed by human PDL fibroblasts might be associated with the differentiation and the regeneration of periodontal tissue. In a previous study, we isolated a cDNA fragment of UNC-50(Genebank accession no. AF077038, DKFZp564G0222, PDLs22) using subtractive hybridization between cultured PDL fibroblasts and gingival fibroblasts. The gene was expressed in PDL fibroblasts, but in gingival

fibroblasts. Although UNC-50, the human homolog of theC. elegans gene unc-50, was reported as a nuclear RNA-binding protein involved in the expression of neuronal nicotinic acetylcholine receptor(nAChR) subunits, its function has yet to be clearly described.

In this study we characterized UNC-50, the human homolog of the C. elegans gene unc-50, in PDL fibroblasts. We also investigated its role in the development of periodontal tissue and mechanical stress-induced cementogenesis. UNC-50 was expressed at relatively high levels throughout the differentiation of PDL fibroblasts in vitro. UNC-50 was also localized to ameloblasts and adjacent cells, differentiating cementoblasts, and PDL fibroblasts and osteoblasts along the root surface and alveolar bone of developing tooth. UNC-50 expression was clearly seen during mechanical stress-induced cementogenesis induced by orthodontic tooth movement.

The results of this study suggest that UNC-50 is related to the differentiation, development, and maintenance of the periodontal tissue of the tooth. Furthermore, UNC-50 might be responsible for molecular events in PDL cells under mechanical stress.

주요 학력 및 경력 :

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