

Growth Factors: Key Biological Mediators Involved in Periodontal Regeneration

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ABSTRACT

Healing of periodontal tissue is a complex process which involves various molecular and biological sequence of co-ordinated events. Growth factors plays a vital role in periodontal regeneration. The following review gives insight into role of various growth factors involved in periodontal regeneration.

Keywords: Cellular Biology, Growth factors, Healing, Regeneration.

INTRODUCTION

The production or regeneration of any tissue type is a complex biological process in itself, requiring intricately regulated interaction between cells, locally acting growth factors, systemic hormones and growth factors, and the extracellular matrix components in which these entities interact. ^[1] In fact, the identity of a particular tissue is defined by the biochemical nature of the extra-cellular matrix it contains as well as the phenotype of the cells within it positioned in a particular spatial relationship to one another and to neighbouring tissue types. ^[2] Recent clinical investigations with focus on regeneration of the periodontium have attempted to define factors involved in the formation of a new connective tissue attachment to periodontally diseased or denuded root surfaces. ^[3]

Biological mediators

The biological mediators control the migration, attachment and proliferation of different cells for periodontal healing. They are growth factors and differentiating factors, bone morphogenic proteins, extracellular matrix proteins, mediators of bone metabolism, and arachidonic acid metabolites. ^[2,3] Growth factors are mitogenic cytokines secreted by certain cells that can be shown to stimulate cell division of their own or in other specific cells. They mediate cellular proliferation, cell locomotion, contractility and differentiation, which are important for growth and wound healing. The combination of growth factors may more effectively stimulate these diverse processes of regeneration than any single growth factor. A combination might consist of one factor that promotes mineralized tissue (bone and cementum) formation, and another factor that stimulates formation of the non-mineralized connective tissues, i.e., periodontal ligament and gingival connective tissue. Various growth factors involved in periodontal regeneration are discussed briefly below. ^[4]

Platelet derived growth factor

It is responsible for increase proliferation and influx gingival fibroblast & PDL cells glycosaminoglycans synthesis; Marginally increases collagen synthesis, myofibroblast

generation proliferation & influx of osteoblasts, cement oblasts and epithelial cells. Main sources for these growth factors are platelets, macrophages, epithelial cells, endothelial cells, smooth muscle cells, bone matrix. Types of platelet derived growth factor includes AA, BB, AB. [4]

Insulin-like growth factor (IGF)

These growth factors substantially increase collagen synthesis; Increases periodontal ligament cells and gingival fibroblast influx & proliferation, glycosaminoglycan synthesis, collagen maturation; Marginally increases cementoblast & epithelial proliferation. Mainly they have 2 types, IGF-1, IGF-2. Sources of IGF are plasma cells, epithelial cells, endothelial cell, fibroblasts, osteoblasts, bone matrix. [5]

Transforming growth factor (TGF)

Mainly it has two types, viz TGF β 1 & β 2 with source being chiefly platelets, macrophages, activated T lymphocytes, osteoblasts, bone matrix. These TGF factors substantially increases collagen synthesis; collagen maturation, fibronectin synthesis; Marginally increases fibroblast proliferation, macrophage influx, osteoblast and cement oblast proliferation and influx. [6]

Epidermal growth factor (EGF)

Chief sources of EGF are platelets, macrophages, epithelial cells, eosinophils, with two main types EGF, TGF- α . They are involved in epithelial cells proliferation and influx; Marginally increases periodontal ligament and gingival fibroblast cell proliferation. [7]

Fibroblast growth factor (FGF)

Various type of fibroblast growth factors is aFGF, bFGF. They increase glycosaminoglycans synthesis, endothelial cell migration, periodontal ligament cells & osteoblasts proliferation and influx; Marginally increases fibroblast proliferation and influx fibronectin synthesis, cement oblast proliferation. Chief source for FGF

are macrophages, endothelial cell, osteoblasts, bone matrix. [8,9]

CONCLUSION

Periodontal tissues undergo regeneration or repair according to the response to various periodontal therapies employed. The newer approach to periodontal regeneration involves the use of biological mediators like attachment proteins, enamel matrix proteins, growth factors and bone morphogenetic proteins which enhances the regenerative potential of the host tissues by providing favourable signals for proliferation and migration of the periodontal ligament cells towards the affected root surface. It is necessary to admit that our knowledge of the healing process in the periodontium is still developing. The goal of completely, restoring the lost periodontal tissues and regeneration of bone above the crestal level in bone defects still remain the challenge. Thus, newer periodontal therapies must be developed in future by keeping in view these goals.

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