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Editorial

Role of BMP'S in periodntal regeneration

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1. Introduction

An infected, inflammatory illness called periodontitis causes bone loss and attachment loss. The process of regeneration of periodontal tissues involves the creation of new alveolar bone, periodontal ligament, and cementum. Current research is examining a number of strategies to accomplish comprehensive, dependable, and repeatable regeneration of periodontal tissues. One of the most important factors in effective periodontal regeneration is the therapeutic control of new bone growth. Within the transforming growth factor superfamily of genes, bone morphogenetic proteins are a distinct set of proteins that play a crucial role in the control of bone induction and maintenance.

BMPs function as chemotactic agents and growth and differentiation factors. They promote the migration, angiogenesis, proliferation, and differentiation of mesenchymal stem cells into cells that create bone and cartilage. Consequently There is a lot of interest in using bone morphogenetic proteins as therapeutic treatments to treat periodontal abnormalities. Periodontal defects can be classified as furcation, suprabony, infra-bony, or as a combination of these defects. Cementogenesis, osteogenesis, and the production of functionally orientated periodontal fibres into freshly created cementum and alveolar bone are all components of periodontal regeneration.

The process of periodontal structure regeneration is intricate and multifaceted, involving the interplay of cells, hormones, growth factors, and extracellular matrix. Molecular biology research has identified bone morphogenetic proteins (BMPs), which control cartilage and bone, as initiators of bone development. [1]

2. BMPs – Recombinant Technologies

Because proteins are strongly attached to both organic and inorganic components of the extracellular matrix of bone, it has been challenging to identify osteogenic proteins in the bone matrix. Therefore, BMP has been produced using recombinant technology in order to evaluate its therapeutic potential. Since the structures of a number of human BMPs have been determined, human complementary DNA sequence can be obtained by using DNA probes. After being cloned, the human cDNA is spliced into a viral expression vector.

For preclinical and clinical evaluation, huge quantities of BMPs have been produced using transfected E. coli and Chinese hamster ovary cells. As a result, the recombinant human-rh-BMP that is created offers the most potential for use in clinical settings. The US Food and Drug Administration (FDA) authorised the use of BMP-2 and BMP-7 in bone regeneration in 2002.This recombinant production approach has the advantages of being repeatable, able to guarantee the BMP's constant purity and activity, and

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free from adventitious agents.

3. Applications for RH-BMP-2 in Dental and Periodontal Repair

BMPs are a family of proteins that have the special capacity to stimulate the growth of bone and cartilage when inserted into a soft tissue site. According to biological research, BMPs differentiate mesenchymal precursor cells into cells that create cartilage and bones both in vitro and in vivo.

This idea, along with the outcomes of the different animal experiments that were previously discussed, indicate that rhBMP-2 may have enormous therapeutic potential in dental and periodontal restoration.It is commonly acknowledged that in these situations, either augmenting the bone stock or replacing lost bone is necessary. There is a chance that the alveolar bone lost as a result of periodontal disease will be replaced, delaying or preventing the loss of teeth.

In fact, Sigurdsson et al. imply that implanting a device containing rhBMP-2 not only restores alveolar bone height but also adds more periodontal attachment machinery. Helping with dental implant placement is one of the potential uses for rhBMP-2. In order to supply enough bone stock for implant placement, this may entail ridge augmentation or sinus elevation treatments. It may also entail implantation into extraction sockets or around implants in order to expedite the placement of implants or their bony integration. [2]

4. BMPS in Periodontal Regeneration

Before being applied and introduced in clinical settings, preclinical research is necessary to estimate the biologic potential, efficacy, and safety of effective and safe therapies for periodontal regeneration. The critical-size supra-alveolar periodontal defect model and the supra-alveolar peri-implant defect model were created and characterised by researchers for these reasons; these models are thought of as litmus tests for potential treatments for periodontal regeneration, alveolar reconstruction, and dental implant osseointegration prior to clinical application.

Since recombinant technology (rhBMP 2) makes it possible to extract and purify BMPs, it has been thoroughly investigated for periodontium regeneration in a range of clinical settings. A single dosage of rhBMP-2 accelerates the usual intramembranous bone production rate and enhances cementum formation during periodontal wound healing, according to animal research.

However, the optimal effects of BMPs are modulated by a range of factors that need careful evaluation in clinical studies; these factors include :BMP dose, Influence of root conditioning, occlusal load release characteristics of the carrier as well as suitability of the model.

To evaluate the efficacy of BMPs, each of these factors may affect the rate of BMP-induced osteogenesis and cementogenesis and subsequent periodontal ligament formation.In the field of periodontal regeneration, much of the research interest has focused on BMP-2 (OP-2), BMP - 3 and BMP-7 (OP-1). In their first human investigation, Bowers et al. (1991) employed a single application of BMP-3 (osteogenin) in conjunction with a demineralized bone allograft in a submerged tooth model to encourage periodontal regeneration.Recombinant human BMP has been used in recent research by Choi et al. (2002), Saito et al. (2003), and Akira et al. (2009) to assess its potential for treating intrabony, supra-alveolar, furcation, and fenestration abnormalities.BMPs have also demonstrated great promise in accelerating wound healing after dental implants. [3]

Table 1: Chatacteristics of specific BMPs in periodontal regeneration

Type of BMP	Characteristics of specific BMP
2	Ostegenesis; induces the expression of cementum attachment protein in human periodontal ligament cells
3	Antagonist of bone density; blocks the BMP-2-mediated differentiation of osteoprogenitor cells into osteoblates
4	Osteinductive; plays role in bone metabolism, stimulates superoxide production and expert proinflammatory effects on the endothelium
6	Stimulates all osteogenic makers in mesenchymal stem cells; induces ectopic bone growth
7	Plays a key role in the transformation of mesenchymal cells into bone and cartilage; induces all of the genetic markers of osteoblast differentiation in many cell type
9	Potent osteogenic growth factor; possess the capability to promote the osteogenesis and chondrogenesis

5. Conclusion

The process of periodontal tissue regeneration involves the induction of alveolar bone, cementum, and periodontal ligament. It is crucial to comprehend the biologic processes of periodontal wound healing and how these processes affect BMP activity, even though numerous studies have demonstrated a significant regeneration of the periodontal tissues when BMP is used. Further research is required to determine the ideal conditions for using bone morphogenetic proteins (BMPs) for periodontal regeneration as well as to create delivery methods with the mechanical and surgical qualities necessary for the regulated release of BMPs.

6. Conflict of Interest

None.

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