II-1. Genetically Engineered PDL and GF Cells as a Potential Source for Cell Therapy in Bone Regeneration

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Background

Periodontal disease is inflammatory disease, inducing loss of periodontal tissue such as alveolar bone, cementum, and periodontal ligament. Ex vivo gene therapy may be utilized for the regenerative ofinnate or acquired loss of tissue structure and function. The success of ex-vivo gene therapy relies on their large-scale purification and production of signaling molecules as well as methods to deliver these factors to their targets. The genetically altered cells have typically been fibroblasts or myoblasts that are easily biopsied and propagated in vitro. BMPs play pivotal roles in bone tissue repair, induce ectopic bone formation and enhance repair of fracture. The use of BMP-2 transduced fibroblasts can contribute to bone formation and induce host tissues to produce bone. Here we report that BMP-2 transduced fibroblasts in periodontium were responsive to BMP-2 and could induce an osteoblastic conversion of nonosteoblastic fibroblasts.

Methods

To examine abilities of fibroblasts in periodontium as gene delivery carrier, osteogenesis of the cells by BMP-2 gene and responsive to BMP-2, we investigated cell proliferation, ALPase activity, mineralization and cell signaling by BMP-2.

Results

The numbers of the cells infected with ad5BMP2 and ad5 were increased in accordance with culture period and ad5 virus didn't show toxic effect on the cells. All the cells

infected with ad5BMP2 showed increased ALPase activity and mineralization. In addition, ALPase activity of PDL cells and HOS cells were increased at cells infected with ad5 and not as well as ad5BMP2, while GF cells were increased at only the cells infected with ad5BMP2. Mineralization was also showed at GF cells infected with ad5BMP2, while mineralization wasn't showed at GF cells infected with ad5 and not. PDL cells and HOS cells showed mineralization at the all the groups. Phosphorylation of smad protein was activated at all the cells infected with ad5BMP2 and treated with rhBMP2.

Conclusion

In conclusion, ex vivo gene therapy for bone tissue regeneration could represent a distinct clinical advantage over recombinant protein, or in vivo gene therapy. Use of cells such as PDL and GF cells, derived from readily accessible, quickly healing tissues, would be associated with less donor-site morbidity than autologous bonny transplants of bone marrow-derived cell therapy. In addition, ability to produce the bone of donor cells is likely to improve the healing in bone defect. Further studies using animal model needs to confirm production of bone *in vivo*.

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