Conference track «Regenerative medicine»

Development of a Bioactive Silica-Graphene Composite with Embedded Growth Factors for Enhanced Dental Bone Regeneration

Научный руководитель – . .

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Abstract :

Effective dental bone regeneration remains a significant challenge in clinical practice. Traditional materials often fall short in providing the necessary support and biological stimuli for optimal bone healing. This study proposes a novel bioactive composite material combining silica, graphene, and embedded growth factors to address these challenges. The objective is to design and theoretically evaluate a bioactive silica-graphene composite with embedded bone morphogenetic protein-2 (BMP-2) and vascular endothelial growth factor (VEGF) for enhanced dental bone regeneration. The proposed composite material consists of a porous bioactive silica matrix, reinforced with graphene to enhance mechanical strength and electrical conductivity. Growth factors BMP-2 and VEGF are embedded within the matrix for controlled release. The material is designed to support cellular attachment, proliferation, and differentiation, as well as promote angiogenesis. The bioactive silica provides a scaffold that facilitates cell adhesion and proliferation. Graphene enhances the mechanical properties and electrical conductivity, promoting cellular activities. The embedded growth factors provide sustained stimulation for osteogenesis and angiogenesis. The hydroxyapatite layer formed on the silica surface ensures stable integration with surrounding bone tissue. The theoretical bioactive silica-graphene composite with embedded BMP-2 and VEGF offers a multifunctional approach to dental bone regeneration. By combining the strengths of bioactive silica, graphene, and growth factors, this composite material holds promise for advancing dental regenerative techniques. Further research and experimental validation are needed to confirm its effectiveness and safety.